REPLY TO
ATTENTION OF:

DEPARTMENT OF THE ARMY
US ARMY CHEMICAL SCHOOL
FORT MCCLELLAN, ALABAMA 36205-5020

S: 1 Jul 98

ATZN-CMR-A 4 May 98

MEMORANDUM FOR SEE DISTRIBUTION

SUBJECT: Preliminary Draft Field Manual FM 3-4-1, Multiservice Procedures for NBC Defense of Fixed Sites, Ports, and Airfields

1. The Preliminary Draft Field Manual FM 3-4-1, Multiservice Procedures for NBC Defense of Fixed Sites, Ports, and Airfields is provided for your review and concurrence. Comments are requested not later than 1 Jul 98. In accordance with Joint Pub 1-01, request comments be categorized as follows:

   (a) **Critical Comments.** Critical comments will cause nonconcurrence in the draft if the concern is not satisfactorily resolved.

   (b) **Major Comments.** Major comments are significant concerns that may result in nonconcurrence in the entire document. This category may be used with a general statement of concern with a subject area, thrust of the document, etc., followed by detailed comments on specific entries in documents that, taken together, constitute the concern.

   (c) **Substantive Comments.** Substantive comments are provided because sections in the document appear to be or are potentially incorrect, incomplete, misleading, or confusing.

   (d) **Administrative Comments.** Administrative comments correct inconsistencies between different sections, typographical errors, or grammatical errors.

2. Electronic copies of this draft are available at the following web sites:

   - USACMLS FTP: ftp://cmls:cmls@160.148.10.105/CMLS/fm3-4-1/pcd
   - Dragon's Lair BBS: http://mcclellan-cmls-bbs.army.mil/

3. On 30 Apr 98, the USACMLS briefed the status of this publication to the Joint Doctrine Working Party (JDWP) and the potential to transition to a Joint Publication. The JDWP decided to vote on the proposal via a message from the Joint Warfighting Center rather than wait for the Oct 98 JDWP. The message will be released soon. If the decision is made to pursue this as a Joint Publication, the Program Directive, milestones, and scope will be reassessed.

4. Until a decision is made, we wish to continue on its current path as a Multiservice publication. With that in mind, request a decision from the U.S. Air Force and U.S. Navy to continue development USAF and USN Service doctrine. If the decision is to continue the development as USAF and USN doctrine, request a point of contact be assigned not later than 1 Jul 98 to assist us in ensuring we capture your unique requirements in the Final Coordinating Draft to be staffed in Aug 98.

5. The USACMLS point of contact is Mr. Harold A. Bobbitt, DSN 865-7462, Commercial: (256) 848-7462; FAX: DSN: 865-7154, Commercial: (256) 848-7154; or E-Mail: bobbitth@mcclellan-cmls.army.mil.

\\\\\\\\\ Original Signed \\\\\\\\\\\\\\

Encl

ROY D. WILLIAMS II
Director of
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ATZN-CMR-A
SUBJECT: Preliminary Draft Field Manual FM 3-4-1, Multiservice Procedures for NBC Defense of Fixed Sites, Ports, and Airfields

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Secretariat Joint Service Material Group

Army, Navy, Marine Corps, Air Force

COORDINATING DRAFT

NBC

MULTISERVICE PROCEDURES FOR NBC DEFENSE OF FIXED SITES, PORTS, AND AIRFIELDS

[PARTICIPATING SERVICE SEALS/CRESTS]

COORDINATING DRAFT
FM 3-4-1
MCWP 3-37.5
[OTHER SVC DESIGNATIONS]

[DATE]

FOREWORD

This publication has been prepared under our direction for use by our respective commands and other commands as appropriate.

General, USA
Commander
Training and Doctrine Command

Lieutenant General, USMC
Commanding General
Marine Corps Combat Development Command

[To Be Determined]
Rear Admiral, USN
Commander
Naval Doctrine Command

[To Be Determined]
Major General, USAF
Commander
Headquarters Air Force Doctrine Center

PREFACE

1. Scope. This publication provides a multiservice doctrinal reference for planning, resourcing, and executing the nuclear, biological, and chemical (NBC) defense of fixed sites, ports, and airfields. Specific tactics, techniques, and procedures are included in its appendixes. During Joint operations, this publication is subordinate to current Joint publications addressing this topic.

2. Purpose. This multiservice publication has been prepared as a revision to FM 3-4-1, Fixed Site Protection. Formerly a single-service manual, this revision has been coordinated and approved by its signatories to address multiservice NBC defense operations and responsibilities at military fixed sites. In the absence of Joint doctrine, this publication is intended to provide leaders and staff planners a doctrinal reference for synchronizing and resourcing successful NBC defense plans for sites such as air/sea ports of debarkation (APOD/SPOD); command, control, communications, computers, and intelligence (C^4I) nodes; logistics bases; and medical facilities.

3. Application. The procedures in this publication apply throughout the US armed forces as specifically represented by the signatory authorities in the foreword.

This publication has not been chartered or approved as Joint doctrine; therefore, its use during Joint operations is subject to operational guidance and directives from the Joint Chiefs of Staff (JCS).

Additionally, it is not the intent of this publication to restrict the authority of Service or Joint force commanders from organizing the force and executing their mission in a manner they deem appropriate.

4. Implementation. Participating Service command offices of primary responsibility will review this publication, validate the information, and reference and incorporate it in Service manuals, regulations, and curricula as follows:

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US Air Force. TBD

5. User Information. The proponent for this publication is the US Army Chemical School (USACMLS) who developed this publication with the joint participation of the approving Service commands. The USACMLS will review and update this publication as necessary.

We encourage recommended changes for improving this publication. Key your comments to the specific page and paragraph and provide a rationale for each recommendation. Send comments and recommendations directly to:

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FM 3-4-1 US Army Training and Doctrine Command
Fort Monroe, Virginia
MCWP 3-37.5 Marine Corps Combat Development Command
Quantico, Virginia
XX-XX [Other Svc Designations/Approval Commands]

[DATE]

NBC

Multiservice Procedures for NBC Defense of Fixed Sites, Ports, and Airfields

CONTENTS **PAGE**

***This publication will supercede FM 3-4-1, Fixed Site Protection, 16 August 1989 when published as approved doctrine.**

CONTENTS PAGE

EXECUTIVE SUMMARY
COMMANDER S OVERVIEW

- **Discusses NBC Defense of Fixed Sites, Ports, and Airfields**
- **Provides a Fixed Site Threat Overview**
- **Discusses Fixed Site Vulnerabilities and Mitigation**
- **Discusses Fixed Site NBC Defense Planning**
- **Provides Tactics, Techniques, and Procedures (TTP) for NBC Defense Planners**

Chapters provide broad overview. Appendixes provide more specific TTP.

FM 3-4-1's three chapters provide a broad background regarding NBC defense of fixed sites, ports, and airfields. Chapter 1 addresses the *Fixed Site NBC Environment;* Chapter 2 identifies *Fixed Site Vulnerability,* and Chapter 3 provides guidance on *Fixed Site NBC Defense Planning and Execution.* Appendixes A through J support and supplement the doctrine within the chapters.

Fixed Site: Developed real estate (facilities and supporting equipment) required to accomplish an operational mission.

Permanently Fixed Sites: Sites that cannot move. In war or conflict, they may be abandoned, but not moved.

Operationally Fixed Sites: Transport-able or mobile facilities not moved due to ongoing operational constraints. For example, movement of field hospitals or critical communications nodes just prior to commencing offensive operations.

Base: A locality from which operations are projected or supported. An area or locality containing installations which provide logistic or other support.

Base Cluster: In base defense operations, a collection of bases, geographically grouped for mutual protection and ease of command and control.

Chapter 1 provides an introduction addressing concerns such as WMD proliferation, lessons learned during Operations DESERT SHIELD/DESERT STORM, Toxic Industrial Hazards (TIH), and worldwide terrorist activities; all driving immediate considerations for fixed site NBC defense. The chapter highlights command responsibilities for protecting the force in today and tomorrow's NBC environment.

Additionally, this chapter establishes standard terminology for fixed sites and defines the operational environment for fixed site operations.

Fixed Sites include command, control, communications, computers, and intelligence (C^4I) sites; ports/seaports of debarkation (SPOD); airfields/aerial ports of debarkation (APOD); logistics bases (POMCUS sites, ammunition storage points/depots, supply depots, maintenance sites, etc.); and medical facilities.

Operational environment discussion is modeled on CJCSM 3500.04, Universal Joint Task List, Chapter 3, Conditions for Joint Tasks.

For planning considerations, the fixed site operational environment discussion includes four parameters:

- **Physical Environment**. Conditions and terrain which, in concert with weather, influences WMD targeting, employment, and effects.
- **Military Environment**. Includes strategic chokepoints; sustainment operations; complex command and control, implications at fixed sites; and strategic centers of gravity. Combined**,** these aspects translate fixed sites into high value targets.

During force projection operations, A/SPOD pose lucrative strategic chokepoints inviting enemy targeting.

As movement of cargo out of the A/SPOD decreases as a result of personnel degradation, logistics throughput and operations are also affected.

Analysis of the operational environment is a critical part of an IPB process supporting effective decisionmaking.

Avoidance. Active and passive measures for avoiding NBC attacks/hazards.

Protection. Defensive measures to provide individual, collective, and materiel protection against NBC hazards.

Restoration. Immediate, operational, and thorough decontamination techniques increase survivability and restore combat power by absorbing, destroying, neutralizing, making harmless, or removing contamination.

Vulnerability Analysis. A continuous process of conducting IPB, NBC Risk Assessment, and NBC Vulnerability Analysis procedures to identify specific mitigation measures.

Although this document focuses on passive defense measures, mitigation measures always include active defense measures.

Protect the Force

Sustain Command and Control

Sustain Combat Support

The amount of resources allocated to protect a fixed site should reflect the value of the site to combat effectiveness.

This chapter relies heavily on JP3-10, Doctrine for Joint Rear Area Operations; JP3-10.1, Joint Tactics, Techniques, and Procedures for Base Defense; and the Military Decision Making Process.

- **Civil Environment**. Cultural influences of religion, nationalism, and ethnic makeup mold civic and political attitudes and economic influences. Industrial and technological capabilities can create and support overt or covert WMD proliferation.
- **Threat Environment**. The WMD threat spans the full spectrum of operations in peacetime and conflict. The WMD threat presents tactical, operational, and strategic implications requiring active and passive countermeasures to address NBC hazards created by nations, terrorists, or by consequence.

Chapter 2 examines fixed site vulnerability, IPB, analysis, and mitigation.

Intelligence Preparation of the Battlespace (IPB) supports the analytical process that allows commanders and staffs to disperse the "fog" of the operational environment and anticipate enemy actions before they occur. IPB becomes the "glue" that connects Chapters 1-3 and Appendixes A-J.

The following characteristics contribute to fixed site vulnerability: bottlenecks, large area targets, high value targets, limited defensive capabilities, limited or no mobility.

Strategic and Operational Impacts. The minimum impact caused by NBC hazards entails a temporary reduction in OPTEMPO for targeted forces/operations. Under less ideal conditions, NBC hazards may delay fixed site operations for hours or days and result in changes of mission and/or mass casualty scenarios. Impacts will vary based on the functional mission of the fixed site.

Vulnerability Analysis. The basic methodology combines IPB, NBC risk assessment, and NBC vulnerability analysis procedures to identify specific measures to avoid, protect against, or reduce the effects of WMD and NBC hazards. Appendixes C and G provide information to supplement existing service procedures.

Chapter 3 focuses on the three key measures to accomplish fixed site NBC defense goals: protecting the force, sustaining C^2; and sustaining combat support. This chapter's three sections include: Fixed Site NBC Defense Roles/Responsibilities (who is responsible); Fixed Site NBC Defense Planning (procedures and considerations); and Resourcing, Deployment, and Execution Guidance (making the plan work).

The appendixes support the planning, resourcing, and execution process by providing detailed "how to" discussion and tools.

Table Exec-1 summarizes appendix contents.

Table Exec-1. Appendix Summary

APPX	SUBJECT	SUMMATION
A	*Fixed Site NBC Defense Task List*	Demonstrates linkage of the Universal Task List at the strategic, operational, and tactical levels and the integration of NBC considerations into planning.
B	*NBC Defense Assets*	A listing of DOD, international, and expedient NBC assets that may be available to support the fixed site NBC defense plan.
C	*Vulnerability Analysis and Mitigation*	A "how to" approach for risk assessment and a discussion on friendly vulnerability analysis supported by tables to assist in mitigation planning.
D	*Fixed Site NBC Defense Planning Tools*	Focuses on preparation of NBC defense templates to support planning.
E	*Fixed Site NBC Defense Execution Tools*	Provides example and blank synchronization matrices for the execution of NBC defense tasks.
F	*Host Nation and Civilian Considerations*	Guides integration of host nation assets and non-combatant considerations and responsibilities into the NBC defense plan.
G	*Toxic Industrial Materials*	Provides tables and templates to assist in situational hazard mitigation planning with emphasis on individual safety.
H	*Fixed Site Decontamination*	Provides decision aids and tables for rapidly addressing NBC contamination and decontamination prioritization.
I	*Contaminated Equipment Retrograde Procedures*	Describes the need for protection from NBC hazards posed by retrograde cargo and equipment. Tables contain available equipment detection sensitivities, maximum exposure limits, and proposed maintenance site controls.
J	*Expedient Protection Options*	Describes potential in-place materiel, procedures, and techniques for expedient protection.

CHAPTER 1
FIXED SITE NBC ENVIRONMENT

Know the enemy and know yourself; in a hundred battles you will never be in peril. When you are ignorant of the enemy but know yourself, your chances of winning or losing are equal. If ignorant both of your enemy and of yourself, you are certain in every battle to be in peril. Sun Tzu *c.*400-320 BC

INTRODUCTION

Significant national security concerns drive the immediate consideration of fixed site NBC defense. These concerns include proliferation of weapons of mass destruction (WMD) and lessons learned during armed conflict from Operations DESERT SHIELD/DESERT STORM and terrorist incidents such as the Khobar Towers (large conventional explosives) and the Tokyo subway (nerve agent) incidents, and the potential for radiological, chemical, or biological hazards. Commanders must consider fully the requirements for fixed site NBC defense. Our forces require protection from these weapons as well as NBC hazards from industrial facilities near or in our area of operations (AO). Commanders have direct responsibility for protecting their force against these hazards. On future battlefields, failure to properly plan and execute NBC defenses for critical fixed sites may result in significant casualties, disruption of operations, and even mission degradation. Further, commanders' mission and execution plans must address the implications of WMD if used at critical force projection choke points, specifically ports of debarkation. Figure 1-1 depicts the force projection chokepoints and WMD challenges confronting a commander in a theater of operations. As forces enter the theater, vulnerability concerns heighten significantly. Protecting the force is of equal or greater concern during forced entry operations as well as offensive or defensive operations.

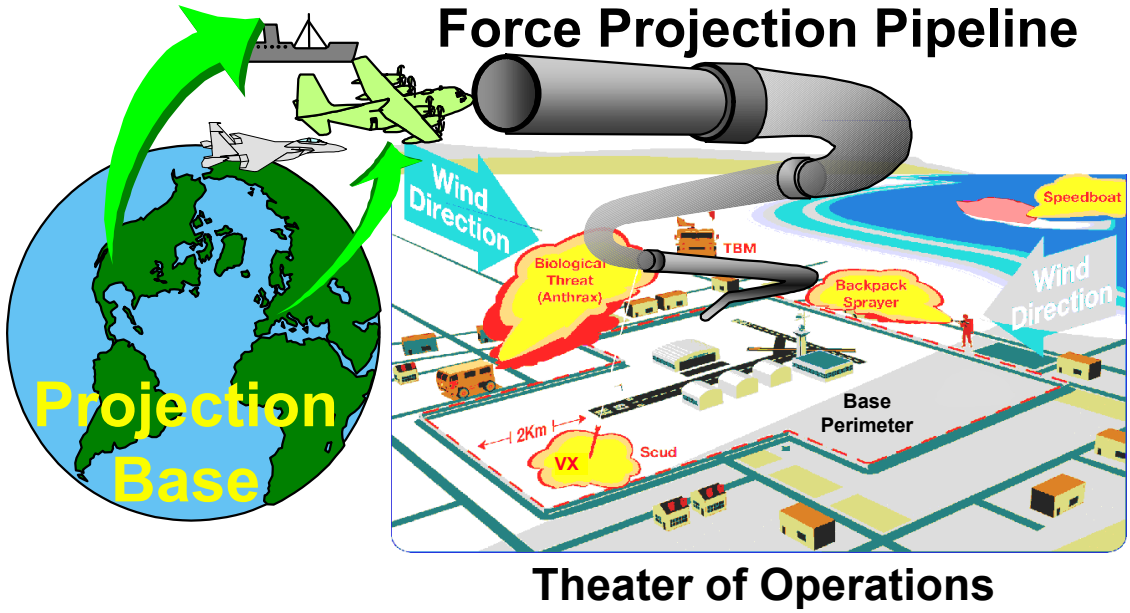

Figure 1-1. Force Projection Pipeline

Notice that the force projection pipeline generally originates from the Continental United States (CONUS) or from an ally (e.g., NATO). Although still vulnerable, ports of embarkation (POE) at the projection base offer an advantage by allowing additional security, flexibility, and standoff. Therefore, enemy WMD targeting efforts will likely focus on the more vulnerable ports of debarkation (POD). WMD employed against sea and air POD and forces not yet deployed to forward areas of operations can create significant casualties and bottlenecks in the resource

pipeline. RESULT: During entry operations, combat power is extremely vulnerable while at or around the POD. During the transition from entry operations to military operations, many elements begin dispersal into their assigned areas of operation. However, fixed sites remain as centers of gravity for sustaining, enhancing, and controlling forward combat power; and, therefore, are a high value target for WMD. It is in the context of this target rich environment that Chapter 1 defines key fixed site terminology and addresses the operational environment of fixed sites.

TERMINOLOGY

Common terminology is essential for establishing effective communication, coordination, and maintaining focus on the scope of this manual. Specifically, the term "Fixed Site" is defined as shown below and discussion is focused toward, but not limited to, the subsequent points:

***Fixed Site*: Developed real estate (facilities and supporting equipment) required to accomplish an operational mission.** For example:

- **Command, Control, Communications, Computers, and Intelligence (C^4I) Sites**
- **Ports/Seaports of Debarkation (SPOD)**
- **Airfields/Aerial Ports of Debarkation (APOD)**
- **Logistics Bases (e.g., POMCUS sites, ammunition storage points/depots, supply depots, maintenance sites)**
- **Medical Facilities.**

Fixed sites can be further categorized as permanently or operationally fixed.

***Permanently Fixed Sites*: Facilities that can not move.** These include preexisting facilities such as ports, airfields, railheads, bridges, and hospitals. If war or conflict comes to these facilities, they may be abandoned, but not moved. Additionally, if WMD make these facilities unusable, they are abandoned, at least until transition to post-conflict operations.

***Operationally Fixed Sites*: Facilities transportable or mobile, but due to ongoing operational constraints, they are not moved.** Examples of operationally fixed sites include the movement of air transportable hospitals or critical communications nodes just prior to commencing offensive operations. Examples may also include stalled convoys and bridging operations.

Related terms that the manual will refer to are ***Base***, ***Base Cluster*, and Weapons of Mass Destruction**.

***Base*: A locality from which operations are projected or supported.** An area or locality containing installations which provide logistic or other support. (JP 1-02)

***Base Cluster*: In base defense operations, a collection of bases, geographically grouped for mutual protection and ease of command and control.** (JP 1-02)

***WMD*: Weapons of Mass Destruction.** In arms control usage, weapons that are capable of a high order of destruction and/or of being used in such a manner as to destroy large numbers of people. Can be nuclear, chemical, biological, and radiological weapons, but excludes the means of transporting or propelling the weapon where such means is a separable and divisible part of the weapon. (JP 1-02) **NOTE:** Throughout this manual, we will use "WMD" when referring to NBC weapons and "NBC hazards" to refer to hazards resulting from either WMD, industrial, or conventional battlefield residual hazards.

The functions and services provided by the fixed sites noted above provide critical C^4I, force projection, and sustainment capabilities for joint forces. Subsequent discussions will initially focus

on A/SPOD during entry operations, and subsequently will address the Joint Rear Area (JRA) and other critical fixed sites as the theater expands and forces transition to operations.

OPERATIONAL ENVIRONMENT

The fixed site operational setting is a diverse and complex environment. This diverse setting includes the physical, military, civil, and threat environment. First, by function, fixed site operations cross each aspect of the physical battlespace; land, sea, air, and space. Secondly, fixed site operations are inherently joint and will likely include JTF operations. Thirdly, in addition to the physical and military environments, fixed site operations, especially aerial and port operations, occur within the complex framework of the host nation and the civil environment. Finally, the significant impact of the NBC threat environment on fixed site operations will be key to discussions in Chapter 2. Commanders will use these four parameters of the fixed site operational environment discussed below as planning considerations for inclusion in joint/multiservice plans and exercises.

Physical Environment

The physical battlespace directly impacts fixed site operations and the physical environment directly influences WMD. WMD can impact force projection and combat operations on land, at sea, and/or in the air. Further, the nuclear component of WMD could also impact the space environment, and command and control networks that rely on this dimension would be severely degraded. Still, the most notable influences of the physical environment on fixed site NBC defense are weather and terrain.

- **Weather.** Weather conditions are the "uncontrollable wildcard" of WMD employment and provide useful cues to probable times and places for WMD use (i.e., employment windows). Diligent tracking of weather conditions helps in assessment of risks to friendly forces from WMD, as well as toxic industrial material (TIM) hazards.

- **Terrain.** In concert with weather conditions, terrain influences where NBC effects may concentrate (e.g., chemical agents in low lying areas); and in many cases, it influences enemy WMD targeting (e.g., exploiting or creating chokepoints).

Military Environment

The military environment of fixed sites includes: strategic chokepoints, sustainment operations, complex command and control (C^2), and centers of gravity.

Strategic Chokepoints. The strategic projection of combat power may require air and sea ports of debarkation. Once forward deployed, these forces require operational sustainment through these same POD. The limited number of useable POD causes an unavoidable concentration of forces at these sites, thus creating an enticing WMD target.

- **Combat Power Sustainment.** Continuity of support from fixed sites is the life blood for sustaining a force's combat power. NBC hazards can interrupt fixed site operations and decrease our forces overall combat power. The intensity of combat operations and fixed site activities vary; however, the fixed site operational tempo (OPTEMPO) remains high. In addition to casualties, an enemy theater missile (TM) with a WMD warhead is a very efficient and effective means of quickly disrupting and/or halting the flow of information and resources to or from the fixed site. The overall impact is a decrease in combat capability.

- **Complex C^2.** Multiple services, activities, and organizational structures (e.g., base clusters, airfield/port operations, and host-nation support) complicate fixed site C^2.

Additionally, fixed site personnel (e.g., logistics, reserve, and host nation/US civilians) may have less training in passive defense measures than combat forces, further complicating C^2 in an NBC environment.

- **Strategic Centers of Gravity.** As the hub for a commander's sustainment and C^2 operations, and with a limited number of POD fixed sites become a critical center of gravity for joint, multinational, and host nation personnel. Result: High value targets for the enemy.

Civil Environment

The culture and economic aspects of the civil environment that significantly influence fixed site NBC defense considerations include religious, national, and ethnic values, and economic industrial/technological capabilities.

- **Cultural Influences.** Cultural influences of religion, nationalism, and ethnocentrism mold civic and political attitudes toward the employment of WMD and definitions of success. These basic ingredients support the volatile and aggressive politics seen in countries such as Iran and Iraq. Strict adherence to national or religious calls to action creates an atmosphere where any element of combat power (e.g., NBC) usage can be rationalized. Further, even in loss, a last blow using WMD weapons could provide an enemy a devastating final blow. Favorable attitudes toward martyrdom create challenging physical security requirements to mitigate suicide attacks against fixed sites.

- **Economic Influences.** Industrial and technological capabilities can be a double-edged sword. A nation's industrial base can support defensive strategies as well as create the prolific environment supporting WMD production, stockpile, and employment. The host nation with developed economic infrastructure and industry can better support redundant lines of communication and/or provide protection and decon resources. Conversely, nations' economic capabilities could support overt or covert WMD proliferation and employment in cultural climates with permissive attitudes or lax counter-proliferation programs.

Threat Environment

The threat environment of today's battlespace spans the full range of operations during peace and conflict. WMD create tactical, operational, and strategic implications for commanders and their forces. Commanders must also weigh the impact of offensive action against enemy NBC production/storage facilities. For example, the downwind hazard following target destruction must be considered. Additionally, countermeasures are prepared to negate the threat posed by industrial hazards and terrorists.

Various countries are known to possess or are suspected of possessing nuclear, biological, and chemical capabilities. Figure 1-2 depicts countries with proliferating (growing) WMD programs. Any country with pharmaceutical and agricultural research capabilities can easily disguise chemical and biological weapons development programs. As countries seek to expand their own WMD programs, potential funding is derived from sales of products and/or technologies to other countries or organizations. This practice sustains the WMD proliferation process.

Combine the proliferation of WMD with the proliferation of ballistic and cruise missile technology and the increasing threat to off-shore assets, rear areas, and fixed sites becomes even more apparent. Since each of the three main weapons of mass destruction (nuclear, biological, and chemical) can be delivered by ballistic missile, smart munitions, or covert devices, the threat environment extends throughout the depth of the battlespace and continues to the force projection base.

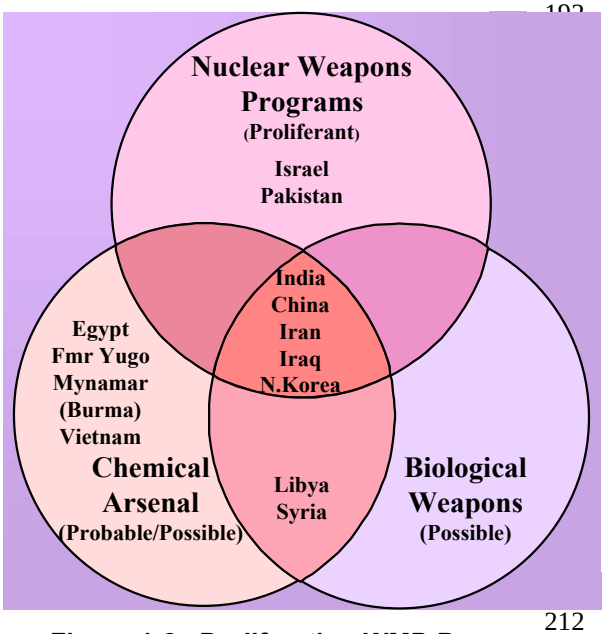

Figure 1-2. Proliferating WMD Programs

- **Nuclear and Radiological Weapons.** The nuclear/radiological threat includes strategic or tactical nuclear weapons, conventional munitions enhanced by depleted uranium (DU), and low level radiation (LLR). Although they are not WMD, DU munitions create a low level radiation threat as a residual hazard of the fired round…a threat present in the expended round, damaged or destroyed equipment, contaminated shrapnel, or smoke from destroyed, DU contaminated vehicles. DU munitions are appearing in more and more armies, and commanders must ensure they conduct additional training that institutes proper safety countermeasures. LLR threats may also occur from inadequate nuclear waste disposal, deterioration of nuclear security or facilities, and collateral or deliberate damage to facilities with radioactive material/sources. Additionally, covert or terrorist agents can use radiological weapons to conduct direct actions against military and/or civilian targets.

- **Biological Weapons.** These weapons use agents/toxins that can be much more lethal than chemical agents in a pound-for-pound comparison. Production costs and low effective doses make these weapons extremely enticing for the "enemy-on-a-budget" who is looking for maximum casualties and psychological impact. Additionally, anti-materiel weapons loom as an emerging biological threat to fixed site functions relying heavily on mechanical and electronic equipment, as well as petroleum fueled power generators, to accomplish their missions.

- **Chemical Weapons.** Compared to biological weapons, chemical weapons offer increased predictability of on-target effects against personnel and equipment and persistency options. As with biologicals, chemical anti-materiel formulas offer the determined belligerent yet another option to target against support activities.

Industrial centers and weapons production/storage facilities can easily become sources of hazards for our forces and their equipment. Deliberate targeting of industrial facilities can produce toxic industrial hazards (radiological, biological, or chemical) as lethal as any WMD arsenal. The same results may occur from collateral damage, accidents, or covert/terrorist activity. Therefore, forces operating in or located near these facilities incur higher risk and vulnerability. This photo suggests that not only are the industrial facilities potential hazard producers, but also the transport vehicles used to move industrial products (e.g., phosgene, chlorine), waste products, and munitions.

The availability of technology to terrorist organizations provides them the flexibility of using conventional weapons, WMD , and/or exploitation of industrial hazards to accomplish their objectives. As a high-leverage, low-risk form of warfare, terrorism creates a breeding ground for the proliferation of WMD, especially for biological and chemical weapons with their low cost per effect ratios. The Tokyo subway incident involving the Aum Shinri Kyu cult's use of the nerve agent Sarin is a prime example of WMD proliferation. The Aum Shinri Kyu cult in Japan was not only involved in chemical weapons research, but also purchased large quantities of Clostridium botulinum, the organism that produces the very lethal botulinum toxin. Additionally, in 1992, the cult demonstrated an interest in the Ebola virus by sending a "medical" mission to Zaire.

CHAPTER 2
FIXED SITE VULNERABILITY

the skillful warriors first made themselves invincible and waited the enemy s moment of vulnerability When an advancing enemy crosses water It is advantageous to allow half his force to cross and then strike an army that lacks heavy equipment, fodder, food and stores will be lost. Sun Tzu *c.*400-320 BC

OVERVIEW

Fixed sites provide critical functions that support force projection and sustainment. Discussions of the threat and operational environment always provide insight into friendly vulnerabilities. This chapter specifically examines fixed site vulnerabilities, Joint Intelligence Preparation of the Battlespace (JIPB), vulnerability analysis, and vulnerability mitigation.

The projected force may require ports of debarkation by SPOD, APOD, or both. Once projected, these forces require sustainment from logistics bases that, above division level, are primarily fixed sites. For a projected force these sites become centers of gravity for Joint, multinational, and host nation mission critical operations and as such are high value targets for enemy WMD.

Worldwide WMD proliferation and the threat of NBC weapons use, overt or covert, require that commanders and their staff planners have a working knowledge of NBC defense principles, fixed site vulnerabilities, and mitigation techniques. Specifically, the Joint Task Force (JTF) headquarters may develop as an ad hoc organization derived from service command assets supporting the CINC mission, requiring key personnel who know how to assess and reduce NBC vulnerability. Additionally, immediate operational requirements may result in the hasty establishment of bases and base clusters within a matter of hours to days. In units without organic NBC staff, NBC defense experts may be assigned after initial planning sessions. Therefore, successful NBC defense planning and execution relies on commanders and staffs understanding the NBC defense aspects of protecting their forces.

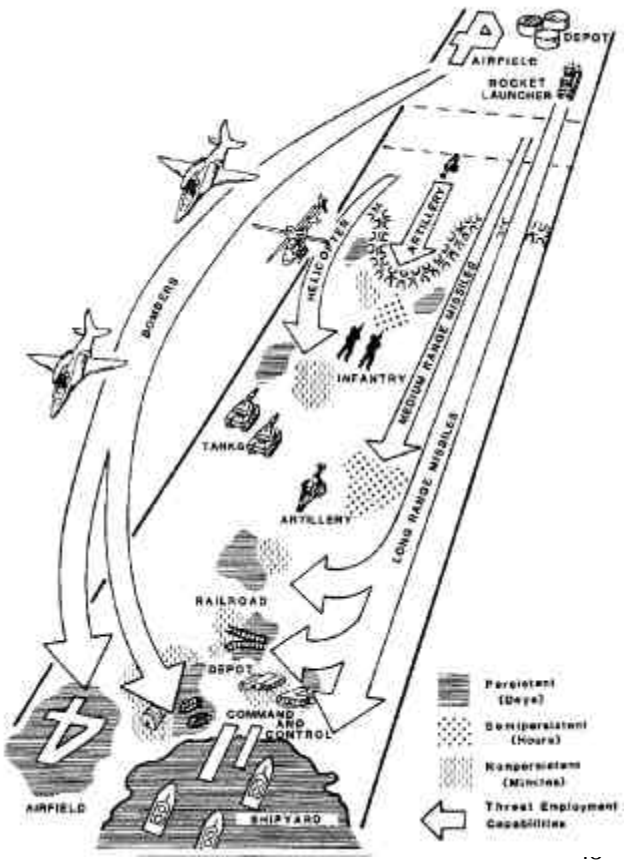

Figure 2-1. Threat WMD Reach

FIXED SITE VULNERABILITY

Forces are most vulnerable and successful operations are at greatest risk during the initial entry phase of force projection operations. NBC protection is especially critical to mission success during this phase of operations. Commanders must ensure they consider and evaluate numerous SPODS and APODS, so they can deploy military forces from different locations in case of NBC attack. This vulnerability is magnified when the enemy possesses WMD. Even during war termination and post-conflict operations, WMD use could occur and again increase risk to our forces. Protecting the force remains a key mission throughout all phases of force projection.

Terrorist and missile attacks are the most difficult to profile, predict, or detect. Figure 2-1 depicts how enemy WMD effects represent a 360° threat, making vulnerability analysis more difficult. Vulnerability analysis plays an increasingly important role in helping the commander focus limited NBC defense assets against the most likely WMD delivery means. It is the enemy's ability to deliver WMD and other existing NBC hazards (e.g., Toxic Industrial Chemical hazards) that causes the commander to assess unit and site vulnerability. However, before discussing vulnerability assessment techniques and mitigation, it's important to understand fixed site characteristics and vulnerability and the strategic and operational impact of NBC hazards to fixed sites.

Fixed Site Characteristics

Commanders recognize that fixed site characteristics make them vulnerable, high value targets. These characteristics include:

- **Bottlenecks.** Inter-theater and intra-theater movement of resources will burden limited POD throughput capacities and create force/equipment concentrations. Additionally, WMD use could cause civilian panic/flight and clog road networks surrounding fixed sites. Therefore, commanders must consider and evaluate other transportation avenues in case of WMD employment.
- **Large Area Targets**. Fixed sites such as base clusters may be dispersed over large areas, helping to decrease the conventional theater missile attack risk. However, this same dispersion increases physical security requirements burdening limited resources, and it encourages enemy selection of WMD because of their large area coverage characteristics.
- **High Value Targets.** Fixed sites represent a series of critical, interrelated functions and concentration of high priority activities, frequently making the fixed site a center of gravity. Additionally, fixed sites often provide one-of-a-kind critical mission functions that have limited redundancy.
- **Limited Defensive Capabilities.** Long range interdiction weapons are most often task organized to support combat operations, leaving limited range defensive weapons such as PATRIOT for active theater missile defense (TMD) of fixed sites. Further, the fixed site operational environment likely possesses limited collective defensive capabilities.
- **Limited or No Mobility.** It is easier for the enemy to target the more fixed sites vice more mobile, tactical targets. Even with extensive camouflage, concealment, and deception (CCD) efforts, the large area nature of fixed sites continues to make them lucrative WMD targets.

Finally, multiple activities, complex organizational structures, and varying levels of expertise in passive defense measures combine to make fixed site NBC defense a challenging yet manageable task.

Strategic and Operational Impacts

Assuming a thoroughly prepared and rehearsed NBC defense plan is implemented, the minimum anticipated impact from NBC hazards is a temporary reduction in OPTEMPO for affected forces. Under less ideal conditions, NBC hazards may delay fixed site operations for hours or days and result in changes of mission and/or mass casualty scenarios. With little or no NBC defense equipment training, Civil Reserve Air Fleet and Merchant Marine movement assets will be delayed or diverted to alternate POD. This section is designed to emphasize the strategic and operational impacts of NBC hazards at specific fixed sites, namely C^4I nodes, ports, airfields, and logistics bases. Subsequent discussions will outline how to plan effectively.

C^4I Impacts. Information hubs such as command centers, communications centers/sites, and intelligence collection sites are prime targets for WMD. Information flow drives decisions. National Command Authority (NCA) decisions and intelligence are transmitted to forces worldwide. Even temporary disruptions of this capability can force modifications of plans and

orders at strategic and operational levels and have catastrophic consequences at the tactical level. Disrupting the C^4I nodes through use of WMD will severely hinder commanders' responsive and timely support for mission operations; therefore, subordinate commanders must clearly understand strategic objectives and intent.

Port Impacts. Reception, staging, onward movement, and integration (RSOI) operations and terminal discharge, transfer, storage, and clearance operations are immediately complicated by increased protective posture. Without plans for redundant facilities, transportation assets, and/or logistics over-the-shore (LOTS); the logistics flow decreases and over time, results in decreased combat power. During DESERT STORM, WMD attacks against Saudi Arabian east coast ports could have forced a heavier reliance on west coast port operations, resulting in a four-fold increase in trucking distances. With too few trucks already, combat power and sustainment may have staged for days, possibly weeks, on the west coast. DOD personnel, fleet and merchant marine assets, loading/unloading capabilities, transportation services, and host nation support (military, civilian, and commercial hires) were all potential casualties or degraded capabilities.

Airfield Impacts. Short of a nuclear attack, the main WMD impact on airlift and combat aircraft is decreased sortie rates. These decreases result primarily from degradation of ground support crews in higher MOPP levels. As cargo aircraft contamination control (CACC), contaminated payload control area (CPCA) measures, and decon operations intensify, payload throughput decreases. Personnel, aircraft, critical materiel handling equipment, and payloads are potential casualties or degraded capabilities respectively.

Like ports, diversion of combat loads to alternate or redundant facilities may result in significant delays in employment of combat forces or delivery of priority payloads. Normally, strategic airlift assets (C-5, C-17, C-141) will not deliver cargo to contaminated airfields. Tactical airlift to contaminated areas is only conducted for critical mission exceptions. As a countermeasure, in-flight refueling can allow combat aircraft to support from outside theater missile (TM) range for limited periods.

Logistics Base Impacts. WMD will primarily influence log base transportation capabilities, exposed supply inventories, and work rates. Contamination of vehicles or ground transport routes creates delays/detours at best and contaminates transporters at worst. Contaminated, uncovered break bulk supplies and ammunition create exposure risks and work rates decrease as personnel operate in increased MOPP levels.

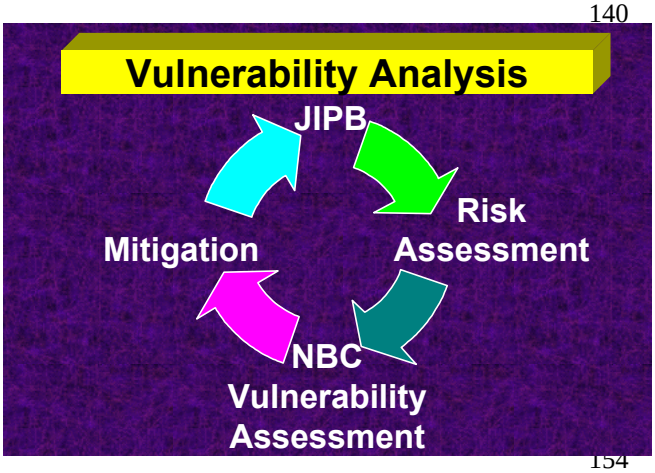

Figure 2-2. Basic Methodology

Hospitals. WMD will create an environment in which a fixed hospital without collective protection will be limited in its patient care capabilities. Contamination of the facility and supplies will create an environment in which patient care will be greatly degraded. The treatment facility can be provided a temporary level of protection using techniques discussed in Appendix J.

VULNERABILITY ANALYSIS

FM 3-14/MCRP 3-37.1A, ***NBC Vulnerability Analysis*** defines vulnerability analysis as "…a systematic method for estimating friendly casualties and/or consequences from enemy …NBC attacks." The basic methodology for NBC vulnerability analysis is shown in Figure 2-2. This section expands on this basic methodology, and Appendix C provides detailed "how to" instructions for risk assessment and analysis.

Joint Intelligence Preparation of the Battlespace (JIPB)

Joint Intelligence Preparation of the Battlespace (JIPB) is a systematic, continuous process of analyzing the threat and environment in a specific geographic area to support staff estimates and military decision making. In other words, JIPB is overlaying facts and assumptions about the operational environment, including enemy information, onto a specific operation. The four step process provides a logical procedure for predicting adversary courses of action (COA) and their impact(s) on friendly operations. The four continuous steps of JIPB are:

- Define the battlespace environment.
- Describe the battlespace effects.
- Evaluate the adversary.
- Determine adversary courses of action.

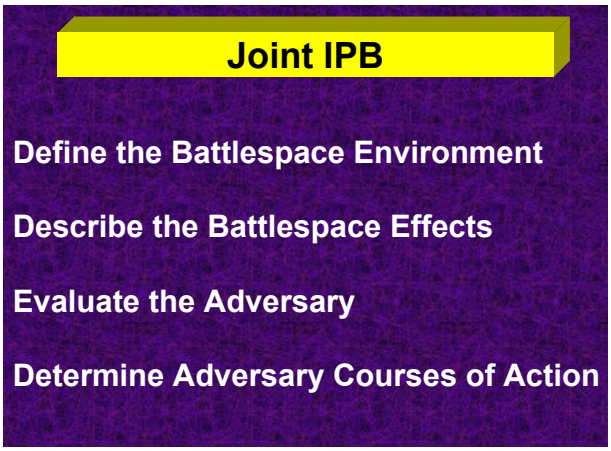

Figure 2-3. JIPB

Every commander and staff conducts JIPB for their operation because it helps the commander anticipate enemy actions. Commanders can then prevent anticipated actions or respond to minimize their impact. Anticipating enemy actions helps to identify friendly vulnerabilities and to subsequently take action to reduce the impact of enemy actions. Figure 2-3 summarizes JIPB. These four steps comprise a continuous process that is integral to fixed site Risk Assessments and Vulnerability Analysis. During friendly COA development, JIPB progresses to a wargaming process that helps the commander identify anticipated enemy actions and respond to minimize their impact. This wargaming is conducted in a "action/counteraction" fashion (i.e., If this COA…then this response…with this potential impact.).

NBC Risk Assessment

Appendix C furnishes detailed NBC risk assessment guides. The guides include JIPB related questions about the battlespace environment and the threat. The answers to those questions impact risk assessments that are associated with recommendations for various NBC defensive measures.

NOTE: These guides are generic and other questions should be added or risk levels upgraded based on unique situations.

NBC Vulnerability Analysis

Nuclear Vulnerability Analysis. Nuclear vulnerability analysis addresses the impact(s) from blast (shock wave); thermal radiation (high intensity light and heat); initial radiation (within first minute after detonation); residual radiation (fallout and induced radiation); and electromagnetic pulse (EMP). The intensity of nuclear explosion effects varies with the weapon yield and type of burst. The severity of their impact on friendly operations is in part, a function of defensive measures taken to reduce vulnerability. Subsequent discussion and Appendix C address these defensive measures in detail. Depleted uranium (DU) and low level radiation (LLR) considerations are addressed in Appendix G.

Biological Vulnerability. Biological vulnerability analysis relies heavily on thorough intelligence (especially national level input) and considers:

- **Immunization Levels/Availability of Prophylaxis** (with respect to anticipated agents)
- **Force Protective Posture** (MOPP)
- **Detection Posture** (deployed biological detection capability)
- **Maneuver (Mobility) Status** (fixed sites are static) and
- **Hygiene Practices.**

Using these five criteria, a rating matrix (Appendix C) provides a subjective degree of vulnerability: High, Medium, or Low. Combined with assessments of agent selection, employment "windows", and medical intervention response times, Appendix C outlines a basic decision related process that supports vulnerability reduction measures for the commander.

Chemical Vulnerability Analysis. Chemical vulnerability analyses focus specifically on casualty estimates. Figure 2-4 provides the basic steps that are addressed in Appendix C. The casualty estimate process relies on thorough JIPB; enemy and physical environment assessments; and friendly mission analysis. The basic inputs for determining chemical casualty effects are: anticipated (or actual) friendly target size, anticipated agent and delivery system, and temperature.

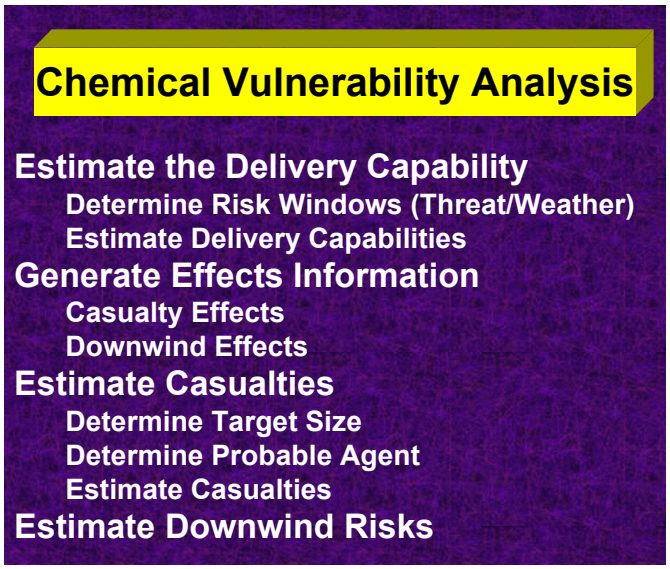

Figure 2-4. Chemical Analysis

It's important to note that in many cases, the enemy's primary objective may not be casualty generation. The primary objective may be target contamination and degradation to our mission capabilities. When critical equipment, facilities, or terrain are contaminated, OPTEMPO may slow dramatically due, not only to casualties, but also to MOPP degradation, decon requirements, and mission adjustments in response to the attack or future attacks. If the only desired effect is casualties, the enemy will likely use only conventional munitions.

VULNERABILITY REDUCTION (MITIGATION)

Fundamental to mitigating WMD effects on fixed sites is recognizing applicable principles of war such as security, economy of force, unity of command, and objective.

- **Security:** Enhance freedom of action by reducing vulnerability to hostile acts. To be successful, fixed site commanders take necessary protection and physical security measures to preserve their capabilities.

- **Economy of Force:** Ensure distribution of assets to accomplish assigned missions while reducing the vulnerability of fixed sites through split-based operations, off-shore operations, and/or maintaining mobility.

- **Unity of Command:** The force is under one responsible commander with the authority to direct required fixed site operations including Theater Missile Defense (TMD) and NBC defense.

- **Objective:** Mutual objectives at fixed sites are focused on key common goals such as protecting the force, C^2, and combat sustainment.

At a more practical level, mitigating fixed site vulnerability includes active and passive defense measures that will reduce the probability of WMD attack and will minimize the effects. With the possible exception of a strategic or operational level C^4I node, fixed site commanders probably have little or no direct control of active defense assets capable of interdicting WMD delivery systems although active defense measures throughout the battlespace and their associated warnings, should trigger passive defense responses. Therefore, the remainder of this chapter will address fixed site considerations relative to passive defense measures.

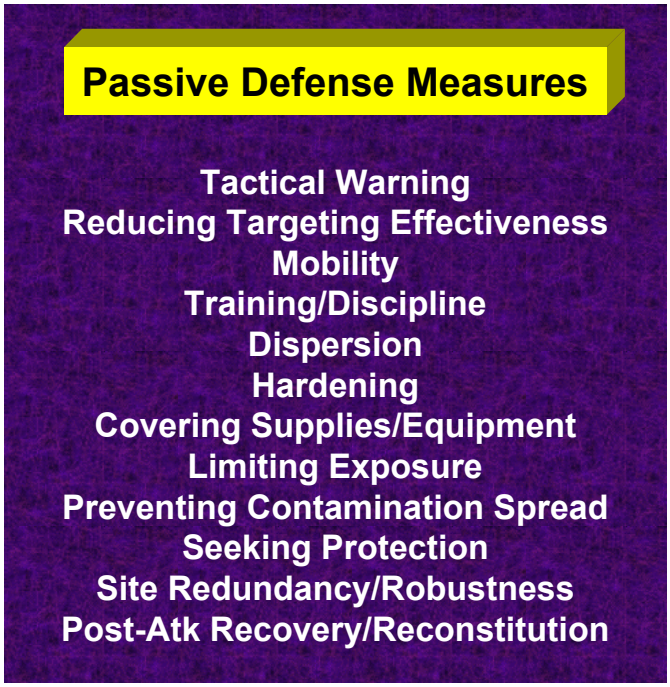

Figure 2-5. Passive Defense Measures

Passive Defense Measures

The Joint Rear Area Coordinator (JRAC) and base cluster commanders recognize that passive defense represents a critical aspect of NBC protection. Figure 2-5 summarizes the principal measures used to accomplish passive defense.

Tactical Warning. Established warning procedures (e.g., pre-attack, attack, and post-attack) help commanders and staffs to acquire, process, and disseminate warning information that minimizes WMD impact. Timely warnings trigger critical individual and collective protection actions and contamination avoidance activities. Warnings are both general (missile launches are imminent or have occurred) and specific (specific units or areas are in danger of attack), or provide notification of an all clear.

Reducing Targeting Effectiveness. Communications security and signature reduction deny enemy sensor and reconnaissance assets key data for acquisition and identification of friendly targets. Friendly measures include camouflage, emission control, cover, concealment, and local unit security to deny enemy key targeting data. Deception misleads enemies by manipulating, distorting, and falsifying friendly actions. Use of decoys or false electronic signatures can deny an enemy key targeting information.

Maintaining Mobility. Although fixed sites are essentially immobile, commanders can sustain force mobility by maintaining flexibility in their operations plans and orders. A commander may decide to use an alternate SPOD, APOD, or LOTS to maintain required throughput. Throughput and capacity considerations may also drive pre-positioning mission essential assets and keeping resources mobile and containerized.

Training/Discipline. DOD military personnel by training and ethic maintain good order and discipline; however, many mission essential civilian personnel (US and host nation) will require

training and personal protective equipment in order to help ensure a disciplined, safe response to a crisis situation.

Dispersion. Dispersion decreases concentration and makes a target less lucrative. Commanders consider physical security needs and the effects WMD could have on their area of operation. Difficult choices will confront them as they consider mission requirements, available terrain, and dispersion requirements. For example, site selection for mission critical assets may result in split-based logistics operations or support from remote areas.

Hardening. Hardening reduces the effect of WMD attack. Careful site and terrain selection, field fortification, and other field expedient or construction methods support increased individual and collective protection.

Covering Supplies and Equipment. COA considerations include identifying what resources require protection and/or covering. Wargaming identifies the impact of covering or not covering selected supplies and equipment. High-value resources receive priority for limited NBC covers.

Limiting Exposure. Limiting exposure is a manageable process. Networks of NBC detection and identification devices provide input as to what assets/locations are or may become contaminated. If possible, curtail or limit operations in these areas, and use other redundant capabilities or surge mission operations in other sectors to sustain operations until the contamination levels are reduced.

Preventing Contamination Spread. Effective mission orders and tactical warning and reporting may reduce and/or preclude the spread of contamination. The integration of NBC detectors into the site's reporting network provides key input. Further, control measures (e.g., traffic control points, barriers, marking) serve to minimize inadvertent entry into contamination areas or use of contaminated resources. Both rotary and fixed wing aircraft movement (taxiing) at airfields, can cause contamination spread. Rotor-wash, prop-wash, and jet blast pick up dust, sand, leaves, and contaminated debris that can contaminate the exterior, and sometimes the interior of the aircraft.

Seeking Protection. Planning identifies protection requirements for personnel and equipment and the assets available to meet those requirements. Take action identify and resource individual and collective protection equipment requirements; search for terrain features or manmade structures for equipment protection; and identify and request support not immediately available in the area of operations. For example: plan and provide hospital treatment facilities temporary protection by sealing all windows, doors and other outside openings with tape and plastic sheeting; turning off the air conditioners/heaters; and establishing an air lock type entry/exit way. This procedure can provide an increased time for the hospital staff to provide the patients with individual protection. They require patient protective wraps (PPW) or MOPP for protection or during evacuation to another medical treatment facility. The hospital gains extended protection by applying the above procedures, plus adding air handlers with CB filters. The air handlers can provide overpressure, thus preventing CB agent infiltration into the facility. Training, resourcing, and executing plans to this level of detail requires active, aggressive planning and implementation.

Site Redundancy and Robustness. Preserving capability may necessitate duplicating functions that are particularly vulnerable. Robustness of "soft" targets such as C^2 nodes and airfields is improved by implementing additional survivability measures.

Post-Attack Recovery and Reconstitution. Following an attack, units conduct area damage control (ADC) measures using available resources to reestablish/reinforce C^2; reallocate or replace communications, personnel, supplies, or equipment; repair battle damage; and/or conduct needed training or mission rehearsals. This may also include operational and/or thorough decon operations. The coordination and operations supporting ADC at fixed sites includes Joint service involvement, host nation participation, and/or third nation interaction.

All of these considerations are critical to fixed site NBC defense preparedness. These factors must be: (1) incorporated into mission plans/orders; (2) used as leverage for requesting resources to support mission execution; and (3) used to identify the mission applicable essential collective and individual tasks. Planning, resourcing, and execution of fixed site NBC defense is the topic of Chapter 3, *Fixed Site NBC Defense Planning and Execution*; Appendix D, *Fixed Site NBC Defense Planning Checklist*; and Appendix E, *Fixed Site NBC Defense Execution Tools*.

CHAPTER 3
FIXED SITE NBC DEFENSE PLANNING AND EXECUTION

Now the elements of the art of war are first, measurement of space; second, estimation of quantities; third, calculations; fourth, comparisons; and fifth, chances of victory. those skilled in the art of war can make themselves invincible but cannot cause an enemy to be certainly vulnerable. Sun Tzu *c.* 400-320 BC

FIXED SITE NBC DEFENSE GOALS

As shown in Figure 3-1, fixed site NBC defense supports three basic operational functions: NBC Protection, Command and Control, and Combat Sustainment.

- **NBC Protection.** Protection is a priority at all levels of war; thus, the supporting principles of NBC defense become a threat-driven priority at all levels and across the full spectrum of operations from peacetime deployment to war.

- **Command and Control (C^2).** Sustainment of this capability is imperative. The impact of WMD requires that C^2 provide timely decision-making and general/specific warnings to mitigate and/or preclude WMD catastrophic effects.

- **Combat Sustainment.** Without combat support and sustainment, combat force OPTEMPO grinds to a halt. Chapter 1, figure 1-1 depicts the deployment pipeline of support and its associated chokepoints. The implementation of fixed site NBC defense plans reduces WMD or toxic industrial hazard (TIH) interruptions to the combat support effort.

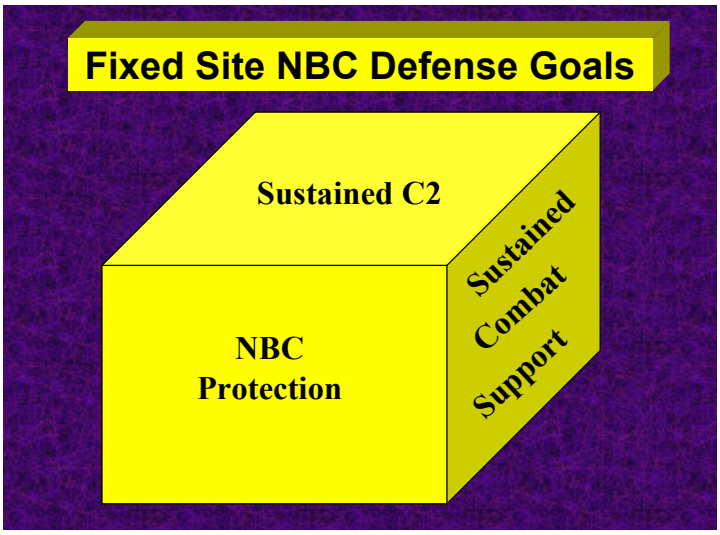

Figure 3-1. Fixed Site NBC Defense Goals

Overview

The primary focus of this chapter and associated appendixes emphasizes providing the JRAC and the base cluster/base commanders and staffs with the doctrinal tools for planning and executing NBC defense tasks. With this focus in mind, this three-section chapter outlines: (1) fixed site roles and responsibilities; (2) NBC defense planning guidance; and (3) resourcing, deployment, and execution guidance for plan implementation.

SECTION I.
FIXED SITE NBC DEFENSE ROLES/RESPONSIBILITIES

As shown in figure 3-2, many decision-makers influence the planning and support of fixed site NBC defense; however, primary execution of the plans relies heavily on the JRAC and base cluster commanders. The following discussion frames the roles/responsibilities of key players. These responsibilities may change based on specific command and/or mission requirements.

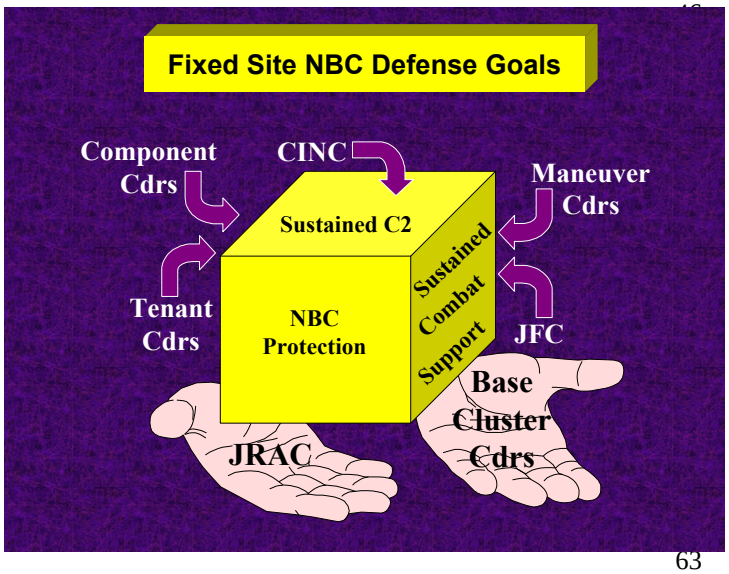

Figure 3-2. JRAC and Base Cluster Influence

COMBATANT COMMANDER (CINC)/JOINT FORCE COMMANDER (JFC)

Although these may or may not be the same person, their NBC defense responsibilities and considerations are similar. The primary difference involves time: JFC level planning will likely be crisis-focused versus deliberate. CINC/JFC planning responsibilities can be summarized as:

- Defining Needs
- Devising Strategies and
- Deploying (Projecting) Resources.

CINC/JFC Responsibilities. JP 3-11, *Joint Doctrine for Nuclear, Biological, and Chemical (NBC) Operations*, assigns combatant commands these NBC defense responsibilities:

- Defensive Posture Consistent with Threat
- NBC Warning and Reporting System (NBCWRS)
- WMD Verification Procedures
- NBC Defense Operations Support of Multinational Forces
- Foreign NBC Information/Intelligence Acquisition/Reporting
- Primary/Alternate Communications Means/Procedures Following WMD Attack
- Procedures for Targeting Enemy WMD Means and
- Procedures for Requesting Use of Riot Control Agents (RCA) and Herbicides.

In addition to NBC and general responsibilities, JP 3-10*, Joint Doctrine for Rear Area Operations*, assigns the CINC/JFC these responsibilities:

- Assessing/Identifying Protection Requirements
- Assigning Base Defense Responsibilities
- Establishing JRA/Base Defense Command Relationships
- Establishing Base Classifications and
- Assigning Responsibilities for JRA Operations Including the Joint Rear Tactical Operations Center (JRTOC).

CINC/JFC Theater Strategic Considerations. The NBC defense implications of these CINC/JFC responsibilities require consideration of several issues.

- **Range of Military Operations.** Civil, physical, military, and threat conditions frame the theater environment and influence the course(s) of action that the CINC/JFC may pursue. Whether war or military operations other than war, theater conditions and threat drive NBC defense planning.

- **Theater Strategy.** Fixed site NBC defense supports the CINC's theater strategy. The translation of strategy into plans/orders is influenced by the vulnerability of strategic centers of gravity (e.g., fixed sites) and the allocation of resources to reduce the vulnerability.

- **Risk Assessment.** CINC risk and vulnerability assessments consider the theater conditions, NBC threat, and the mission (theater strategy). Assessments help identify NBC defense mitigation requirements and shape the commander's NBC protection guidance.

- **Theater Strategic Protection.** The commander's NBC protection guidance contains specified and implied tasks for fixed site NBC defense. Subordinate elements address these tasks in their plans/orders. NBC protection guidance, in addition to physical security requirements, may also address:
    - Contamination Avoidance Guidance
    - Operational Exposure Guidance (OEG)
    - Troop Safety Criteria
    - MOPP Levels
    - Collective Protection Requirements
    - Electromagnetic Pulse (EMP)/Transient Radiation Effect on Electronics (TREE) Countermeasures
    - Medical Countermeasures (e.g., vaccines and prophylaxis)
    - Camouflage, Concealment, and Deception (CCD) Measures
    - Host Nation (HN) support and
    - Environmental impact considerations.

- **Joint Operations Planning and Execution System (JOPES).** Joint staffs plan operations using JOPES. Commanders and staffs must identify NBC mitigation and protection requirements in the JOPES. JOPES serves to control strategic/tactical movement of units/resources, including NBC defense units and resources.

- **Force Requirements.** Force development is a Service responsibility; however, task organization for combat is a CINC/JFC matter. NBC defense tasks require specialized resources and/or equipment and in many cases, specialized forces not readily available in each Service. Including force requirements into JOPES ensures the force deployment list includes capabilities to accomplish NBC defense. JP 3-33, *Joint Force Capabilities*, provides detailed information on Service capabilities.

- **Operation Planning Guidance.** JP 3-11, *Joint Doctrine for Nuclear, Biological, and Chemical (NBC) Defense*, (Annex C, Appendix A) provides NBC defense planning guidance that commanders can use to supplement Annex F of the Joint Strategic Capabilities Plan.

- **Readiness Considerations.** Joint readiness is the CINC ability to integrate and synchronize ready combat and support forces to execute the assigned mission. Essentially, NBC defense readiness is: training, planning, deploying, and employing NBC defense assets and forces to support mission success during WMD or TIH conditions.

COMPONENT COMMANDERS

Component commander responsibilities and considerations remain basically the same with the following exceptions.

- Assessments focus on component mission and identify component NBC defense requirements and shortfalls.

- Joint interoperability coordination supports joint force readiness and mitigates potential component shortfalls. For example, fixed site warning mandates interoperability. USAF and USN components without maneuver NBC reconnaissance assets may require help verifying contamination-free areas for proposed sites/missions.

- Rear Area Operations Center (RAOC) or Rear Area Tactical Operations Center (RTOC) establishes connectivity to the JRTOC (if assigned rear area operations missions).

Component Commanders are also required to incorporate NBC defense planning, exercises, equipment, personnel decontamination measures, and preventive measures into overall security planning and operations throughout the JRA.

JOINT REAR AREA COORDINATOR (JRAC)

The JRAC, as defined in JP 3-10, is responsible for coordinating the overall security and area damage control efforts of the Joint Rear Area (JRA). Specifically, the JRAC incorporates provisions and procedures for NBC defense to include warning and reporting procedures. Figure 3-3 depicts a possible organizational structure with the USAF component commander as the JRAC.

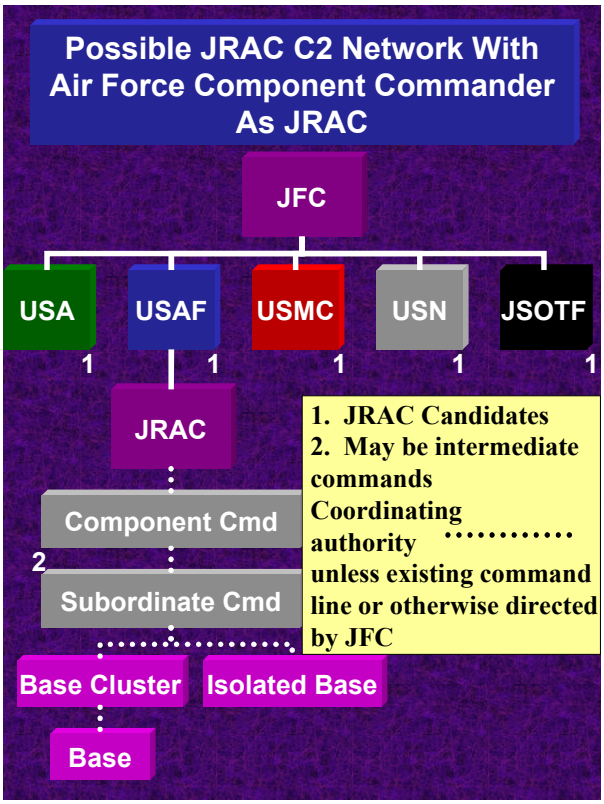

Figure 3-3. JRAC From JF HQs

General Coordination Responsibilities.

- Coordinates JRA Security.

- Dedicates NBC protection Assets to:
  - Integrate Security
  - Conserve Resources and
  - Prevent Support Degradation.

- Establishes JRTOC (if required) with Joint Intelligence Center (JIC) Interface.

Specific Coordination Responsibilities.

The JRAC ensures that JRA commanders and staffs incorporate appropriate NBC planning, exercises, equipment, personnel decontamination measures, and preventive measures into overall security planning and operations throughout the JRA. Table 3-1 shows other specific responsibilities.

Table 3-1.

JRAC SPECIFIC RESPONSIBILITIES	
• **Security Plan/Posture**	• **Chain of Command** (if granted)
• **Threat Estimates/Threat Response Forces**	• **Base Criticality and Vulnerability Assessments**
• **NBC Defense Plans/NBCWRS**	• **Area Air Defense**
• **Unit and Facilities Positioning/Stationing**	• **Infrastructure Development and Positioning**
• **Multinational and HN Liaison**	• **US and HN Legal Guidelines**
• **Key Lines of Communication Security**	• **Additional Security Forces** (as required)
• **Prioritize Security for Key Operations**	• **Adjacent Force Coordination**
• **Civil Affairs and Judge Advocate Support**	• **Tactical Combat Force (TCF)** (if established)
• **Intelligence, Counterintelligence, and Law Enforcement Networks**	• **Liaison with Naval Coastal Warfare Commander (NCWC)**

BASE CLUSTER/BASE COMMANDERS

Fixed sites will fall into a base or base cluster category depending on geographical dispersion, activities, and functions. For example, a port designated as a base cluster might consist of berthing, railhead, and marshaling area bases; all part of a synchronized port NBC defense plan. In turn, the base cluster commander controls and coordinates the base defense plans of separate base commanders. Each base commander develops plans that include a NBC defense annex and may also include a camouflage, concealment and deception (CCD) or smoke annex. Further details on base defense are addressed in JP 3-10 and JP 3-10.1, *Joint Tactics, Techniques, and Procedures for Base Defense*.

Base Cluster Commanders. When designated, base cluster commanders are generally responsible for coordinating the defense of the bases within their base cluster and integrating base defense plans into a base cluster defense plan. Unless specifically delegated to him, the base cluster commander does not have tasking authority except as provided during emergency situations addressed in JP 0-2, *Unified Action Armed Forces*. The base cluster commander is specifically responsible for the following actions.

- Establishes a Base Cluster Operations Center (BCOC). This BCOC should be established only if delegated authority to plan, direct, coordinate, integrate, and control base cluster defense activities is granted. The BCOC becomes the primary focus for controlling and coordinating base cluster NBC defense and for tracking NBC resource status and task execution.

- Establishes an alternate BCOC.

- Maintains linkage with RAOC/RTOC or JRTOC, as required.

- Provides Facilities and Housing for Base Liaisons.

Base Commanders. In an emergency, the base commander is considered an area commander with authority and command for execution of base defense actions to include the employment of transient forces in the base area (JP 0-2, *Unified Action Armed Forces*). The base commander also performs the following actions.

- Establishes a Base Defense Operations Center (BDOC) with linkage to BCOC/RAOC/RTOC/JTOC as required (See BCOC note above).

- Establishes an alternate BDOC.

- Augmenting defense with transient forces in the base area.

TRANSIENT COMMANDERS

IAW JP 0-2, transient commanders in the vicinity of fixed sites may be required to support base defense with their organic assets, including NBC defense capabilities. In force projection operations, commanders quickly move combat power away from the POD to reduce force vulnerability (e.g., dispersing rotary wing assets shortly after arrival at POD during Operation DESERT SHIELD). However, since combat sustainment flows through the POD, the transient commander has a vested interest in assisting with NBC defense emergencies.

FIXED SITE TENANT COMMANDERS

Tenant commanders of forces assigned to a base cluster/base retain responsibility for unit protection and NBC defense. However, tenant commanders may also be tasked to:

- Help prepare/integrate base defense plans
- Conduct and/or support individual, unit, or US/HN civilian NBC defense training
- Provide BDOC/BCOC staff with NBC expertise
- Provide NBC defense equipment support (e.g., decon or engineer equipment) and
- Provide tenant-sector or base NBC emergency response teams and support (e.g., NBC survey and monitoring teams, NBC casualty collection points, contamination control teams, MOPP exchange points, medical CB incident response teams/emergency medical teams).

NBC DEFENSE STAFF PLANNER

This officer or noncommissioned officer may be a career NBC professional or may have little or no specialized NBC defense training. Regardless of the background, the minimum knowledge requirements include thoroughly understanding the military decision making process (MDMP), NBC defense principles, and force capabilities. General responsibilities include:

- Ensure NBC Threat is Identified/Disseminated
- Communicate NBC Threat in Plans/Orders
- Train Forces to the Threat
- Assess NBC Readiness/Vulnerabilities
- Identify NBC Defense Requirements
- Develop/Recommend NBC Defense Guidance and
- Track Requirements/Execution.

As special staff normally supporting the plans or operations officer, these planners track the current and developing NBC situation for the commander and provide critical input during the MDMP. These and other specific responsibilities are discussed in detail in Section II.

SECTION II.
FIXED SITE NBC DEFENSE PLANNING

This section focuses on key portions of the military decision making process which require extensive input from the operational NBC defense planner to ensure recommended courses of action include appropriate NBC defense considerations. These NBC defense considerations, framed within the context of mission analysis and COA development, will comprise the NBC Staff Estimate and corresponding NBC defense plan with recommendations such as:

- Mission Support Concept for COA
- Mission Risks and Vulnerabilities
- Mitigation Measures
- Task Organization for NBC Defense
- Tasks to Tenant and Transient Forces/Units

- HN and Civilian Considerations and
- Asset Availability and Visibility.

MISSION ANALYSIS

Mission analysis helps focus the base commander and staff planning throughout the decision making process. Table 3-2 exemplifies the mission analysis process as defined in FM 101-5, *Staff Organization and Operations*. These steps are not always conducted sequentially and many are continuously or periodically reviewed and reassessed. **NOTE:** To properly support the command, NBC defense planners must understand not just the NBC defense mission, but the overall fixed site mission and intent. Since numerous doctrinal references exist for the military decision making process and Joint operations planning, remaining discussion will focus on NBC defense aspects of the MDMP. Discussion of selected mission analysis steps follows and can be applied to NBC defense, smoke, and NBC recon annex development as well as the basic OPLAN/OPORD.

Table 3-2. (Example)

Mission Analysis Steps	
Step 1	**Analyze Higher Headquarters Order (Mission, Intent, Concept, Time Lines, Adjacent Units Missions, Assigned AO)**
Step 2	**Conduct Initial JIPB (Define the Operational Environment, Describe the Battlespace Effects, Evaluate the Adversary, Determine Most Probable/Most Dangerous Adversary COA)**
Step 3	**Determine Specified, Implied, and Essential Tasks**
Step 4	**Review Available Assets**
Step 5	**Determine Constraints**
Step 6	**Identify Critical Facts/Assumptions**
Step 7	**Conduct Risk Assessment**
Step 8	**Determine Initial Commander s Critical Intelligence Requirements (CCIR)**
Step 9	**Determine the Initial Reconnaissance Plan**
Step 10	**Plan Use of Available Time**
Step 11	**Write the Restated Mission**
Step 12	**Conduct a Mission Analysis Briefing**
Step 13	**Approve the Restated Mission**
Step 14	**Develop the Initial Commander s Intent (What the Fixed Site Must Do To Succeed)**
Step 15	**Issue the Commander s Guidance**
Step 16	**Issue Warning Order (Restated Mission, Cdr s Intent, AO, CCIR, Risk Guidance, Recon Requirements, Deception Guidance, Specific Priorities, Time Plan, Rehearsal Guidance)**
Step17	**Review Facts/Assumptions (Periodic Process)**

Higher Mission and Intent (Step 1). Review the mission and intent for NBC protection guidance and combat/combat support priorities that result in specified or implied NBC defense tasks such as exposure guidance or support priorities.

Conduct Initial JIPB (Step 2). Using the four-step JIPB process discussed in Chapter 2, NBC JIPB attempts to identify the enemy's most likely and most dangerous NBC COA (including TIH considerations) as it pertains to the friendly mission.

Specified, Implied, and Essential Tasks (Step 3). Review the plan/order for specified or implied NBC defense tasks. If time is limited, review only the basic plan, the intelligence annex, the NBC annex, the logistics annex, fire support annex, air defense annex, rules of engagement annex, engineer annex and if present, the civil affairs annex. Appendix A, Fixed Site NBC Defense Task List demonstrates the use of CJCSM 3500.04A, *Universal Joint Task List* to describe specific tasks and their implied and supporting NBC collective tasks. This appendix can also be used to design the commander's NBC defense Mission Essential Task List (METL).

Review Available Assets (Step 4). Review the available assets (forces, equipment, supplies, HN support) for capabilities to support identified tasks. Immediately identify task organization or equipment/supply capability shortfalls to the appropriate operations or logistics planner.

Determine Constraints (Step 5). Shortage of mission essential assets is an immediate constraint on operational capabilities. Other NBC defense constraints include items such as resupply rates, decon throughput capability, environmental considerations, military and civilian NBC training readiness, and HN NBC support requirements.

Identify Critical Facts/Assumptions (Step 6). Facts and assumptions help shape COA development and analysis. Example facts and/or assumptions are shown in Table 3-3. This table follows the Mission, Enemy, Terrain and weather, Troops, Time, and Civilian considerations (METT-TC) format. Their status as fact or assumption relies almost exclusively on specific mission situations. Although many facts available from the higher command's plan/order reduce time requirements, they do not eliminate responsibility for subordinate staff planning and independent JIPB/analysis.

Table 3-3.

Possible Facts/Assumptions Affecting NBC Defense Plans	
• Higher Mission/Intent	• Command Mission/Intent
• NBC Mission/Intent	• Enemy NBC Weapons/Agents
• Enemy NBC Delivery Capabilities	• Enemy NBC Protection Capabilities
• Enemy NBC Protective Posture	• Enemy NBC Intent
• WMD Terrain Considerations	• WMD Weather Implications
• Task Organization	• NBC Defense Capabilities
• NBC Defense Training Status	• NBC Protection Capabilities
• NBC Protective Posture	• Unit Dispositions
• NBC Resupply Rates	• Available Time
• Required Time	• HN/Civilian Support Requirements
• HN/Civilian Capabilities/Limitations	• HN/Civilian NBC Equipment and Training Requirements
• Availability of Pretreatments and Prophylaxis	

Conduct Risk Assessment (Step 7). Using charts similar to those found in Appendix C, the NBC operational planner assesses the nuclear, biological, and chemical risks. NBC vulnerability analysis allows further detailed evaluation of risks and mitigation measures during COA development.

Determine Initial Commander s Critical Information Requirements (CCIR) (Step 8). The NBC defense staff offers WMD CCIR for the commander's consideration. CCIR include information for both friendly and threat forces, and are normally limited to less than 10 questions. Fixed site examples might include: "Will the enemy use persistent chemical agents on LOG BASE ALPHA?" or "Will organic decon assets of the theater reserve force be available to support airbase restoration operations?". Remember, good CCIR: ask only one question; focus on a specific fact, event, or activity; and provide intelligence required to support a single critical decision.

Determine the Initial Reconnaissance Plan (Step 9). Determine key events or "triggers" for launching NBC recon or survey teams, and then prioritize use of available NBC recon assets. Based on initial JIPB, identify likely WMD or TIH hazard areas (these areas become Named Areas of Interest or NAI). Associate specific units/teams with specific NAI. Subsequently, the intelligence officer will turn this initial plan into a recon and surveillance plan with specific mission taskings assigned by the operations officer. Ensure unit taskings match unit capabilities. For example, units without special hazardous materials training and equipment are not good candidates to perform TIH reconnaissance.

Plan Use of Available Time (Step 10). "Using available time" goes beyond simple time management and synchronizing assets with execution requirements. Overlay friendly timelines with projected enemy timelines to mitigate or exploit the visible windows of risk or opportunity.

Conduct a Mission Analysis Briefing (Step 11-13). The commander is briefed on the mission analysis products and recommended restated mission. Key input from the NBC defense planner includes discussion of WMD and TIH hazards, their associated risks, and critical mitigation measures.

Develop the Initial Commander s Intent (Step 14). During mission analysis the commander develops his intent. The intent statement includes the conditions for success with respect to the adversary, the terrain, or the desired end state. For example, from a fixed site perspective, intent may require specific OPTEMPO support rates or sortie generation rates; therefore, NBC planning and priorities must support the sustainment of these specified rates.

Issue the Commander s Guidance (Step 15). Key aspects of command guidance for the NBC defense planner are: CCIR, Risk Guidance, Priorities of Support (avoidance, protection, decontamination, recon, and smoke), time lines, and rehearsals.

Issue a Warning Order (Step 16-17). Unless the NBC threat is immediate, NBC guidance in non-chemical unit warning orders is generally restricted to minimum protective posture or time-sensitive requirements such as initiating needed medical immunizations, prophylaxis, preparation of medical treatment facilities to receive NBC casualties, and/or preparation for restoration operations. As the staff begins course of action development, they conduct a periodic review of facts and assumptions.

COURSE OF ACTION (COA) DECISIONS

Staffs develop, analyze ("Wargame"), compare, brief, and recommend COA for the commander's approval. The NBC defense planner follows the same method developing COA for the fixed site NBC defense plan. Each COA must meet the criteria of:

- **Suitability** (to accomplish the mission and meet the commander's guidance)
- **Feasibility** (to accomplish the mission in terms of available resources)
- **Acceptability** (advantages gained justify the costs)
- **Distinguishability** (each COA significantly different from others) and
- **Completeness** (answers who, what, where, when, how, and why).

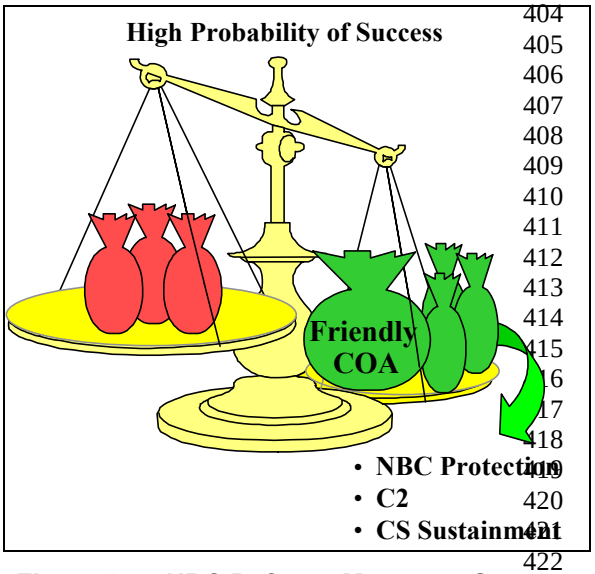

Figure 3-4. NBC Defense Measures Support COA

Before the staff conducts the COA decision brief, the NBC defense planner critiques each COA included in the briefing based on the ability of NBC defense assets to support each COA (see figure 3-4). In addition to mission support, he uses the NBC defense principles (Avoidance, Protection, and Restoration) to assess how well each COA supports the fixed site NBC defense goals: NBC Protection, Sustained Command and Control, and Sustained Combat Support.

As the primary staff analyze relative combat power or support capabilities, generate options, and array forces, the NBC staff officer is analyzing each COA based on current JIPB, risks, and vulnerability assessments (see Appendix C for more detailed instructions). This approach produces threat-based NBC defense requirements and tasks that the planner recommends for assignment to specific units/assets within the available force structure. Unsupported requirements or unacceptable

risks/casualties become disadvantages for later comparison to other COA and/or mission support requests to higher headquarters.

The end result is an NBC defense strategy (NBC defense estimate) for each viable COA. Therefore, when the commander approves a COA, the basic NBC defense support plan is completed with minimum delay.

NBC STAFF ESTIMATE

The NBC Staff Estimate includes NBC defense recommendations for each COA and the approach used to prepare COA recommendations. The estimate follows this basic outline with emphasis on unique NBC defense considerations of each item.

- Mission
- Situation and Considerations
  - Characteristics of the AO (Weather, Terrain, Other, such as TIH)
  - Enemy Forces (WMD Capabilities, WMD Intent, WMD COA)
  - Friendly Forces (Friendly COA; NBC Risks and Vulnerabilities of Each COA; NBC Defense Capabilities/Limitations of Each COA; NBC Resource Status; Mitigation Requirements for Each COA; and Key Considerations such as Mission, NBC Protection, C^2, and Sustainment Support for Each COA)
  - Assumptions
- Analysis (Advantages/Disadvantages of Each COA Using Key Considerations)
- Comparison (COA Ranked by Each Consideration and with Decision Matrix)
- Recommendation and Conclusions
  - Most Supportable COA from NBC Defense Perspective (see figure 3-5)
  - Issues, Risks, Vulnerabilities, and Mitigation Recommendations

Once the commander selects the COA, the COA conclusions (issues, risks, vulnerabilities, and mitigation) form the basis for the recommendations to include in the NBC defense plan.

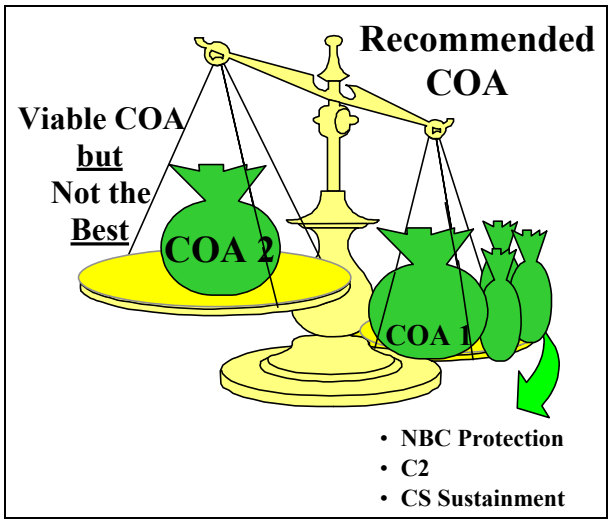

Figure 3-5. Best COA

FIXED SITE NBC DEFENSE PLAN

The fixed site NBC defense plan evolves from mission analysis, COA decisions, the NBC estimate, and commander's guidance. The plan addresses NBC hazard avoidance, protection, and restoration. Therefore, depending on the detail, it may consist of separate annexes for basic NBC Defense; NBC Reconnaissance, Surveillance, and Monitoring; Smoke Operations; and/or Restoration Operations. Using tools and templates like those in Appendixes D and E, the basic plan/annex must address the following items:

Enemy NBC Situation. As previously discussed, also include TIH (see Appendix H), smoke, flame, riot control agent (RCA) considerations, NBC capabilities, and employment risk windows if not addressed in the intelligence annex.

Friendly NBC Situation. This includes tenant and transient NBC defense capabilities/locations with projected arrival and departure times for transients. Identify NBC defense task organization, smoke, flame, and RCA guidance.

Mission. The standard mission statement answering who, what, when, where, and why.

Execution. Critical subparagraphs include:

- **Commander s Intent**. Achievable/measurable criteria for success, such as no more than 10% WMD casualties or less than 15% decrease in sortie generation.
- **Scheme of NBC Defense Operations.** Descriptive overview of how NBC defense will be executed. Include smoke guidance or refer to smoke support annex.
- **Tasks to Subordinate Tenant Units.** Detailed task assignments to each tenant unit with execution guidance as required.
- **HN Tasks.** By HN agreement only.
- **Emergency Tasks to Area Transient Units.** Emergency support taskings to transient units in the base AO.
- **Rehearsals.** Locations, times, required attendees and special requirements.
- **Coordinating Instructions.** **Due to the multiservice/international nature of fixed site operations, do not assume SOP remain valid! Develop interoperability agreements as necessary.**
    - Minimum MOPP Levels and Flexibility Guidance
    - Contamination Avoidance Guidance
    - Troop Safety Criteria
    - Operational Exposure Guidance
    - Automatic Masking/Unmasking Guidance (if different from unit SOP)
    - Reporting Requirements (if different from unit SOP)
    - Actions Prior To, During, and After WMD Attack
    - Identified Observer Units (if different from unit SOP)
    - WMD Sample Collection Guidance and Transfer Points
    - Location of Potential NBC Hazardous Civilian/Military Facilities
    - Instructions/Procedures for Civilian Interaction/Support and
    - Area NBC defense responsibilities.

Service Support. Use subparagraphs to address:

- Contaminated Casualty Collection Points/Procedures
- Procedures for Contaminated Remains
- Locations of Consolidated NBC Defense Equipment
- Locations of Field Expedient Decon Supplies/HN Support
- Decon/MOPP Exchange Points
- Restoration Priorities
- Special Contamination Control Requirements
- Retrograde Contamination Monitoring Sites
- NBC Equipment/Supply Controlled Supply Rates and Prestockage Points and
- Procedures for Chemical Defense Equipment “Push” Packages.

Command and Signal.

- Location of Chemical Staffs and Supporting Units
- Warning Signals/Alarms
- NBCWRS Instructions and
- STRIKEWARN Instructions.

SECTION III.
RESOURCING, DEPLOYMENT, AND EXECUTION GUIDANCE

With the OPLAN approved, staff officers then convert the plan into an effective OPORD. Critical staff tasks involve follow-up and supervision to ensure mission support resources are deployed and synchronized to successfully execute the NBC tasks identified in the OPLAN. Periodic reassessments of the JIPB, facts, assumptions, and "details" such as unit/resource availability, provide necessary updates for improving the NBC defense annex(es) to the OPORD. This section focuses on NBC defense resource considerations; deployment planning, including task organization techniques; and employing NBC defense assets for specific mission execution.

FIXED SITE NBC DEFENSE RESOURCES

Operational planners track and maintain asset availability and visibility during planning, deployment, and execution. Resourcing begins during course of action development. As staffs develop COA, they recommend the best combination of resources to support the mission and COA. As the situation develops and planners identify required functions, recommendations for the time-phased force deployment list (TPFDL) emerge. These recommendations should heed basic resource considerations and should not be restricted by current task organization. Basic resource considerations include Mission Requirements, Resource Capabilities, and Resource Availability/Visibility.

Mission Requirements. Specified, implied, and essential tasks require force allocation and resource planning for task execution. NBC defense tasks require that all forces maintain individual protection and self decon capabilities, as well as operational decon capability.

Resource Capabilities. As planners develop force allocation and resourcing plans, they assess force and equipment capabilities from a broad, practical, expedient viewpoint versus a narrow definition of "published" capability. For example, 125 gpm pumps found in numerous fuel support units are not defined as decon support equipment; however, adding a hose with fire fighting nozzle provides an operational decon capability. This operational approach expands the commander's employment options and adds flexibility during mission execution.

Resource Availability/Visibility. Planning and execution of fixed site defense measures involves all base/base cluster activities. Failure to provide, or delays in providing support adversely impact base activities. Total asset visibility is critical, and this task is made especially difficult due to the many transient tenants found on or near fixed sites. Command emphasis, staff planning/supervision/follow-up, and asset visibility can help eliminate most resource availability issues such as:

- Deployment Priorities
- Mission Priorities
- Time/Space Factors
- Maintenance Status
- Inventory Status
- Resupply Rates, and
- Requisition Status.

Understanding force and resource capabilities, including those outside the current task organization or DOD, helps operational planners provide flexibility of NBC defense support with available resources.

Resource Types and Sources. Primary sources of NBC defense assets include DOD units and NBC defense equipment. Functionally, NBC defense equipment can be classified IAW the NBC defense principles: avoidance, protection, and restoration. Additionally, fixed site NBC defense

resource needs may require international/coalition or HN support. Further, CCD requirements could necessitate use of smoke and obscurants. Appendix B provides detailed resourcing information and options for use during planning. It is designed to address capabilities useful for fixed site NBC defense and does not address all the specialized variations of some NBC defense equipment, for example: aircraft variations of protective masks.

Deployment planning is key to ensure the proper mix and type of NBC defense resources. Task organizing and deploying required capabilities and resources synchronized with execution requirements depend on successful deployment planning.

DEPLOYMENT PLANNING

Operational planners use two fundamental products for deployment planning: the Commander's Task Organization and the TPFDL. Effective command and staff communication with regard to these products is mandatory. Otherwise, entire units and unit sets of equipment could sit idle at an air or sea port of embarkation; combat or combat support resources not available to support the mission. Once resources enter the movement/logistics pipeline, the deployment system provides total asset visibility, even in transit. The challenge: quickly move tremendous tonnage and volumes of resources through a strategic pipeline with finite throughput capacity. How is it accomplished? Mission Focused Task Organization and TPFDL.

Task Organization. The commander task organizes the force to accomplish mission requirements; however, mission task organization and timelines are impacted by available air and sealift deployment capabilities. The keys to force design (task organization) are flexibility, balance, and mission focus. The joint task force is organized to achieve maximum effectiveness from each contributing component (i.e., USAF, USN, USMC, USA). Commanders determine the proper mix of force capabilities in order to maintain flexible, effective, and efficient support to the mission. Task organization decisions are always mission-focused - every deployed asset must be able to support the mission.

For example, the existence of a biological threat may not support the deployment of an entire Biodetection company. Mission analysis may establish a requirement for only the C^2 element and one platoon. Unless the mission is a "demonstration" of biological defense capability, the deployment of the entire unit would waste valuable strategic lift capability. Table 3-4 provides ideas for building modular Army NBC defense deployment packages. These packages are designed to (1) support mission-specific NBC defense tasks; and (2) provide flexible support to other "non-standard" chemical unit tasks. The concept entails providing economy of force while supporting mission execution and command flexibility. Similar methodology applies to other Service NBC defense capabilities as well.

Time-Phased Force Deployment List (TPFDL). Once the commander determines task organization and deployment priorities, the deployment sequence and timelines for the task-organized units are established. The commander and supporting movement control centers use time-phased force deployment data (TPFDD) to:

- Maximize Transport Throughput Capacity Based on Command Established Mission Priorities
- Resolve Transportation Conflicts Based on Mission Priorities and
- Synchronize Force Arrival with Mission Priorities/Time Requirements.

NOTE: TPFDL priorities will change based on JIPB updates and/or changes. NBC staff officers will closely monitor the deployment of NBC defense resources, to include verifying their status on the TPFDL. Resources not appropriately prioritized to mission requirements could arrive too late to support the mission. Resources not prioritized or even listed would wait for movement indefinitely.

643 **Table 3-4. Army Chemical Force Development Matrix**

Operational Level Of War				
Operational Intelligence	**Operational Movement & Maneuver**	**Operational Fires**	**Operational Command & Control**	**Operational Support**
Supporting Chemical Functions				
• Collect information on enemy operational situation and hazards[1-3] • Process Operational Information[1] • Develop Indications and Warning[1] • Prepare Operational Intelligence Reports[1]	• Overcome Operationally Significant Obstacles[2] • Provide Protection for Operational Forces and Means[1-5] • Remove Operationally Significant Hazards[4] • Employ Concealment Techniques[5] • Conduct Deception in Support of Campaigns and Major Operations[5]	• Advise on Nonlethal Attack on Operational Targets[1] • Reduce Enemy Operational Force Effectiveness[5] • Reduce Enemy Critical Facilities Effectiveness[5] • Advise on Employment of Nuclear Weapons[1]	• Acquire and Communicate Operational Information and Maintain Status[1] • Assess Operational Situation[1] • Determine Operational Actions[1]	• Provide Field Personnel and Health Services[2-4] • Reconstitute Forces[4] • Conduct Civil Affairs in Theater or AO[1-5]
Tactical Level Of War				
Intelligence	**Mobility & Survivability**	**Fire Support**	**Battle Command**	**Logistics**
Supporting Chemical Functions				
• Collect Threat Information[1] • Collect Physical Environment Information[2] • Consider Enemy Doctrine[1] • Develop Impacts[1] • Prepare Reports on the Battlespace Area[1]	• Facilitate Movement on Routes[2] • Protect Individuals and Equipment[1-5] • Employ Protective Equipment[1-5] • Remove Battlespace Hazards[4] • Decontaminate Personnel and Systems[4] • Employ Smoke and Obscurants[5] • Employ Physical Deceptions[5]	• Advise on Use of Flame[1] • Advise on Nonlethal Technology[1]	• Receive and Transmit Enemy Information[1-5] • Store Information[1] • Display Information[1] • Publish and Reproduce Information[1] • Manage Information Distribution[1] • Evaluate Incoming Information[1] • Coordinate Support[1]	• Provide Field Services (Bath)[4] • Conduct Civil Affairs in AO[1-5]

Chemical Function	**Minimum Deployable Package**
1 = NBC Staff Activities	**NBC Battle Staff (24 hr Manning)**
2 = NBC Reconnaissance	**Squad (Tactical) Team (Strategic)**
3 = Biological Detection/Identification	**Platoon**
4 = Decontamination	**Squad (Operational Decon) Platoon (Thorough Decon)**
5 = Smoke/Obscurants	**Platoon**

644

645 ## FIXED SITE NBC DEFENSE EXECUTION

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647 The fixed site environment requires clear, concise mission guidance for effective NBC defense
648 execution. However, a clear, concise mission order does not guarantee successful mission
649 execution. Success is never assured; however, certain measures can support critical preparation
650 for the successful conduct of NBC defense. These measures include:

651

652 • **Anticipate Enemy COA.** Wargame the NBC defense plan periodically. Continue to "What if"
653 the probable COA as new intelligence develops, and modify friendly mission requirements
654 appropriately. Just like friendly forces, the enemy desires the least predictable COA that
655 supports his objectives.

656

- **Critique the Plan.** After individual plan critique, ask a staff officer of a different specialty or Service to critique the NBC defense plan. If he were the enemy, what weaknesses would he target? If he were a subordinate commander or tenant unit, could he execute the plan with no additional guidance?

- **Check, Check, and Re-Check Resource Status.** Asset visibility is a critical component of NBC defense. Locating resources following a WMD attack creates a reactive environment supporting enemy intent. Implement measures to ensure all base personnel, including civilians, have personal NBC protection or have a nearby consolidated issue point for quick distribution. Do not hesitate to seek command assistance with stalemated issues.

- **Rehearse, Rehearse, Rehearse.** At home station, forces train to perform individual and collective NBC defense tasks as units and Joint forces. However, once alerted or mobilized for deployment, all training is a rehearsal for executing combat missions. Units will move in and out of the fixed site, sometimes daily, creating new, unknown variables that may hinder successful execution. HN civilians supporting base operations need frequent rehearsals and retraining.

- **Track the Battle.** Appendixes D and E provide tools for implementing the NBC defense plan and for synchronizing NBC defense actions based on identified threat "triggers" or events. However, unless the NBC defense staff tracks the friendly and enemy situation, these tools become ineffective for maintaining a proactive NBC defense.

- **Plan and Execute Redeployment as Thoroughly as Deployment Operations.** NBC defense and environmental aspects of redeployment, retrograde of personnel and equipment, and post-conflict remediation are extensive and are addressed separately in Appendix I.

- **Mission Focus**. Frequently ask, "Does this support the Mission?"; "Will this support the Commander's Intent and Criteria for Success?". Stay alert to intelligence indicators reflecting possible changes in enemy objectives and anticipate their mission implications. If the Commander, Chief of Staff, Plans Officer, or Operations Officer is deciding COA, be there to provide NBC defense recommendations or to determine current NBC defense plan implications.

Regardless of how well the plan has addressed enemy courses of action, our forces must respond to NBC hazards quickly, precisely, and as a team. Referring to Operation DESERT STORM, Joint Pub 1, *Joint Warfare of the US Armed Forces*, says, "...the most striking feature of this campaign was the high degree of teamwork...for the cohesion and efficiency in the components were blended into a higher order of trust and confidence in the joint team...." This citation goes beyond command and support relationships established in plans/orders and hinges on trust, cohesion, and common objectives.

698

APPENDIX A
FIXED SITE NBC DEFENSE TASK LIST

OVERVIEW

This appendix provides a common start point for identifying requirements to conduct a successful fixed site NBC defense. Unique situations will generate unique mission requirements that preclude a "text book" solution. However, the thought process in the discussion and examples, combined with experience using the referenced documents, should provide staff focus during operational planning.

The Universal Joint Task List, Version 3.0, CJCSM 3500.04A (UJTL) provides an interoperability tool for Joint Force Commanders to communicate mission requirements in terms of joint tasks, conditions, and standards. It also serves as a common language and reference system for JFC, operational planners, combat developers, and trainers. When synchronized with Service specific universal task lists (UTL), the UJTL becomes a tool for ensuring interoperability and integration down to the tactical level of task execution. These UTL allow commanders to develop their mission essential task list (METL) and help focus training and mission requirements.

This appendix is provided for the same reason — as a tool to assist commanders at various levels with the development of their mission supporting NBC METL. Although many of these tasks do not directly apply to the Base Cluster/Base Commander, they do provide insight into specified and implied tasks at higher levels of command.

NOTE: A quick review of these tasks reveals the apparent omission of intelligence, surveillance, and reconnaissance tasks. This appendix was written assuming that an NBC threat capability already exists and that it was identified as a battlefield condition in the basic OPLAN. It also assumes that intelligence collection efforts continue to define the NBC threat environment.

STRATEGIC NATIONAL LEVEL

Under NBC conditions, the following Strategic National Tasks (Table A-1) provide policy guidance influencing the development of the CINC NBC METL.

Table A-1. Strategic National Tasks Providing Policy/Direction

Task Number	Task	*Implied Task*
SN 1.1.5	Determine Impact of Threat, Climate, and Geography on Deployment.	*Conduct NBC Vulnerability Analysis.* *Adjust Deployment Based on NBC Threat.*
SN 3.4	Protect Strategic Forces and Means.	*Protect Forces and Means Against NBC Threats.* *Implement NBC Warning and Reporting System.* *Provide NBC Protection.*

STRATEGIC THEATER LEVEL

Assuming NBC threat conditions for a specified theater or AOR, the following tables provide tasks considered critical for the development of the appropriate commander's NBC METL. These baseline tasks are foundational and are not meant to be all-inclusive or restrictive to commanders' NBC METL development.

Table A-2. Baseline NBC Defense Strategic Theater Task

Task Number	Task	*Implied Task*
ST 4.3	Distribute Supplies/Services for Theater Campaign and COMMZ.	*Establish Stockage Levels for NBC Equipment and Supplies.*
ST 4.3.2	Provide Supplies and Services for Theater Forces.	
ST 6.1.5	Provide Theater Missile Defense.	*Develop Passive Missile Defense Plan.*
ST 6.2.8	Establish NBC Protection in Theater.	*Manage the NBC Defense Battle:* *Assess Friendly and Enemy Capabilities.* *Reduce the Threat.* *Maintain Current and Predictive Situational Awareness.* *Maximize Force Effectiveness.* *Enabling Tasks* *Visualize the NBC Battlefield.* *Protect Against NBC Hazards.* *Conduct NBC Restoration Operations.*

OPERATIONAL LEVEL

Baseline tasks at the operational level directly influence the fixed site base cluster/base commander as well as units operating in and around fixed sites, ports, and airfields. The supporting NBC defense tasks shown adjacent to the baseline tasks (Table A-3) may be specified or implied tasks included in operations plans or orders. Additionally, operational planners can associate required tasks to specific mission resource requirements equating to capabilities and functions. As the operational concept develops, the task organization evolves to provide those required capabilities/functions at the right time and location (Time Phased Force Deployment and Synchronization).

Table A-3. Baseline NBC Defense Operational Tasks

Task Number	Task	*Supporting Task*
OP 1.3.1	Overcome Operationally Significant Barriers, Obstacles, and Mines.	*Bypass, Cross, or Operate Within NBC Contaminated Areas.*
OP 4.5	Manage Logistic Support in Theater of Operations/JOA.	*Provide Logistic Support in an NBC Environment.*
OP 4.6	Build and Maintain Sustainment Bases.	*Provide NBC Protection.*
OP 6.1.5	Conduct Operational Area Missile Defense.	*Develop Passive Missile Defense Plans.*
OP 6.2.8	Establish NBC Protection in Theater of Operations/JOA.	*Assess NBC Threat.* *Develop Indicators of NBC Use.* *Identify Potential NBC Weapons Locations.* *Predict Threat Use.* *Develop Hazard Estimates.* *Detect/Verify NBC Hazard.* *Warn Units in Hazard Area.* *Notify Force of Long-Term Hazards.* *Analyze the Risk.* *Optimize the Use of NBC Defense Assets.* *Provide Joint NBC Warning and Reporting.* *Restore Forces After Attacks.*

TACTICAL LEVEL

Units conduct specific NBC defense tactics, techniques, and procedures such as detection, identification, and decontamination at the tactical level. Each Service has an approved task list for tactical operations. Although some minor differences exist in the Services' execution of NBC defense tasks, the basic principles and concepts are the same. The following tables provide the baseline NBC defense tasks for each Service given NBC threat conditions and the defense of a fixed site. As before, these tasks may be specified or implied in operations plans/orders.

Table A-4. Army Baseline NBC Defense Tactical Tasks

Task Number	Task	Supporting Task
ART 6.2	Protect Individuals and Systems.	*ART 6.2.1.4 Employ Protective Equipment.* *ART 6.2.1.6 Provide NBC Protection to Friendly Forces.* *ART 6.2.1.6.1 Employ Contamination Avoidance.* *ART 6.2.1.6.2 Identify NBC Hazards.* *ART 6.2.1.6.3 Warn Personnel and Units of Contaminated Areas.* *ART 6.2.1.6.4 Report Hazards Throughout the Battlespace.* *ART 6.2.1.6.5 Use Individual and Collective NBC Protective Equipment.* *ART 6.2.1.6.6 Employ Pretreatments, Prophylaxis, and Have Immunizations Up-to-date.* *ART 6.2.2 Remove Battlespace Hazards.* *ART 6.2.2.1 Decon Personnel and Systems.* *ART 6.2.2.1.1 Perform Immediate Decon.* *ART 6.2.2.1.2 Perform Operational Decon.* *ART 6.2.2.1.3 Perform Thorough Decon.* *ART 6.2.2.1.4 Perform Patient Decon.* *ART 6.2.3 Minimize Risks from Battlespace Hazards in AO.*

Table A-5. Navy Baseline NBC Defense Tactical Tasks

Task Number	Task	*Supporting Task*
	TBP	

Table A-6. Marine Corps Baseline NBC Defense Tactical Tasks

Task Number	Task	*Supporting Task*
	TBP	

Table A-7. Air Force Base Line NBC Defense Tactical Tasks

Task Number	Task	*Supporting Task*
	TBP	

SCENARIO EXAMPLES

The following examples demonstrate the application of the UJTL task analysis process to derive specified and implied NBC defense tasks. These tasks become mission requirements that must be resourced in subsequent plans/orders and supplemented with thorough staff supervision and follow-up.

Although not demonstrated, the same fundamental approach carries through the Service UTL as well.

Persian Gulf Illustration

In the early hours of August 2, 1990, an Iraqi force of more than 100,000 personnel, spearheaded by three armor divisions, invaded Kuwait.

On August 7, the U.S. National Command Authority directed the deployment of US forces in response to Saudi Arabia's request for assistance. USCENTCOM responded rapidly, placing the first US forces on the ground within 31 hours of the initial alert order.

Operation DESERT SHIELD was a two-phase operation. The first phase involved the initial deployment of forces to deter further Iraqi aggression and to defend Saudi Arabia. The second phase included the subsequent deployment of forces to resource the coalition with a robust counteroffensive capability that could evict the Iraqi Army from Kuwait. Although some units did not begin to deploy until late November, they were in place and combat-ready by early February 1991.

The tailoring of a proper force mix for this operation required the mobilization of thousands of guardsmen and reservists-the largest mobilization since Word War II. During this force-projection operation, the services deployed nearly a half-million personnel, their supporting equipment, and 60 days of supplies from the United States and Europe. All this was pipelined through fixed sites, ports, and airfields within a period of six months.

During this operation, the existing WMD threat influenced commanders' selection of mission essential tasks. The focus at each level of command was mission accomplishment and protecting the force; however, the specific tactics, techniques, and procedures used at the various echelons differed.

Persian Gulf Example 1

Using the Persian Gulf illustration, Table A-8, Example 1 illustrates how application and use of the NBC warning and reporting system (NBCWRS) varied from the Strategic to the Tactical Level.

- NBCWRS use at the Tactical Level (e.g., fixed sites) emphasized reacting and reporting key information.
- Operational Level focus emphasized attack confirmation and/or issuance of Selective or General TMD warnings.
- Strategic Theater considerations emphasized establishment of:
    - Interoperable theater warning network
    - Theater level assessments and
    - Forwarding of applicable national level intelligence.
- Strategic National concerns involved:
    - Providing forward deployed forces with requisite resources (e.g., personnel, equipment, units)
    - Forwarding WMD related intelligence information
    - Assessment of evaluated report information and
    - Political-military concerns with regard to targeting and/or potential retaliatory strikes.

Table A-8. UJTL Task Analysis Persian Gulf Examples 1 and 2

	STRATEGIC NATIONAL	STRATEGIC THEATER	OPERATIONAL	TACTICAL
APPLICABLE TASKS	**SN 3.4** Protect Strategic Forces & Means	**ST 6.2.8** Establish NBC Protection in Theater **ST 6.1.5** Provide TMD	**OP 6.2.8** Establish NBC Protection in Theater of Operations/JOA	**ART 6.2** Protect Individuals and Systems
Example 1				
SUPPORTING OR IMPLIED TASKS	Implement NBCWRS	Develop Passive TMD Maintain Situation Awareness	Detect/Verify NBC Hazard Warn Units in Hazard Area	**ART 6.2.1-6.3** Warn Personnel & Units of Contaminated Areas
ACTIONS	Provide Intel Reports Evaluate NBC Report Input	Theater Warning Network Interoperability Assessments	Attack Confirmation Select/General TMD Warning	React/Report
Example 2				
SUPPORTING OR IMPLIED TASKS	Provide NBC Protection	Conduct NBC Restoration Operations	Restore Forces After Attack	**ART 6.2.2.2.3** Perform Thorough Decon
ACTIONS	Provide Units/Resources Provide Lift Assets	Prioritize Deployment of Decon Resources	Estimate Decon Requirements Task Organize	JF/HN Rehearse Thorough Decon Operations

Persian Gulf Example 2

Using the same Persian Gulf illustration, Table A-8, Example 2 outlines possible fixed site force structure considerations at various echelons of command.

- Tactical Level collocated army, air force, or HN assets rehearse combined/joint thorough decon operations.
- Operational Level commanders and staff:
  - Estimate decontamination requirements for water, supplies, equipment, and unit needs
  - Conduct chemical unit task organization and
  - Establish applicable command or support relationships.
- Strategic Theater commanders and staff prioritize the flow of NBC defense units and other resources by determining who, when, and where (e.g., TPFDL considerations) various assets will arrive.
- Strategic National considerations involve factors such as furnishing required assets and providing strategic mobility for deployment.

Stability Operations and Support Operations Illustration 1

On April 20, 1999, National Command Authority announced the beginning of a Show of Force on request from the government of Cortinia. By April 21, 1999, US aircraft had begun airlift of US forces to the AO. In turn, US military personnel moved to pre-positioned combat vehicles and deployed to training areas for combined live fire training exercises. Concurrently, USMC units, including armor elements, began offloading and preparing for rehearsals with Cortinian armored forces. The armor unit basic load contained DU munitions. Further, extensive amounts of particulate matter in the atmosphere restricted line-of-sight visibility due to slash and burn deforestation and neighboring country volcanic eruptions.

Stability Operations and Support Operations - Example 1

Table A-9, Example 1 indicates the identified tasks and corresponding actions at each command level.

- JCS concerns specified NBC protection as a METL task and furnished applicable technical and safety information and subject matter experts (SME) from other federal agencies.
- The CINC (Strategic Theater) ensured inclusion of NBC protection in the METL, and used available SME to conduct initial risk and hazard assessments.
- The JTF Commander conducted detailed NBC hazard assessments, and provided hazardous materials (HAZMAT) training guidance to deploying units.
- The USA and USMC deploying personnel received HAZMAT briefings and training, to include DU awareness training.

Table A-9. UJTL Task Analysis Stability Operations and Support Operations Examples 1

	STRATEGIC NATIONAL	STRATEGIC THEATER	OPERATIONAL	TACTICAL
APPLICABLE TASKS	**ST 6.2.8** **Establish NBC Protection in Theater**	**SN 3.4** **Protect Strategic Forces & Means** **SN 1.1.5** **Determine Impact of Threat Climate & Geography on Deployment**	**OP 6.2.8** **Establish NBC Protection in Theater of Operations/JOA** **OP 4.6** **Build & Maintain Sustainment Bases**	**ART 6.2** **Protect Individuals & Systems**
Example 1				
SUPPORTING OR IMPLIED TASKS	**Maximize Force Effectiveness** **Protect Against NBC Hazards**	**Conduct NBC Vulnerability Analysis** **Protect Forces & Means Against NBC Threats**	**Assess NBC Threat** **Develop Hazard Estimates** **Notify Force of Hazard**	**ART 6.2.1.6** **Provide NBC Protection of Friendly Forces**
ACTIONS	**NBC Protection in METL** **Provide National Level Tech Data**	**NBC Protection in METL** **Conduct Initial Hazard Assess-ments**	**NBC Protection in METL** **Provide Detailed Hazard Assess-ments** **Provide HAZMAT Training Guidance**	**DU Safety Training** **HAZMAT Classes and Specialized Training**

Support Operations Illustration 2

On February 1, 1999, National Command Authority tasked USCENTCOM to conduct a site assessment prior to deployment of a JTF to Krasnovia for Nation Assistance Operations. The first elements of the Site Assessment Team (SAT) arrived in Krasnovia February 4, 1999. USCENTCOM mission intent specified that force protection and troop safety was crucial. Initial investigation indicated key facilities and terrain vicinity a proposed JTF fixed site were possibly contaminated by toxic industrial chemicals during prolonged occupation by a neighboring military power. The HN lacked the capability to determine extent and level of contamination. Subsequently, requests were submitted to augment the SAT with additional resources including USAF Civil Engineers and USA Medical and NBC resources. These personnel and equipment including NBC Reconnaissance Systems arrived February 15, 1999 and began their risk assessments.

Stability Operations and Support Operations - Example 2

Table A-10. Example 2 indicates the identified tasks and corresponding actions at each command level.

- Strategic National considerations emphasized:
  - Force Protection
  - Overall Assessments, and
  - Crisis Action Teams providing guidance and decisions on emerging issues.
- Strategic Theater efforts furnished:
  - Required Resources, and
  - IPB, Risk Assessment, and Vulnerability Analysis Products.
- The JTF Commander provided:
  - A SAT Command and Control Element
  - Conducted Task Organization
  - Coordinated HN Logistics and Security Support, and
  - Provided IPB and Risk Assessments from SAT Input.
- The Augmented SAT Conducted:
  - Standard Assessments
  - NBC and Toxic Industrial Chemical Reconnaissance and
  - Determined/Reported Extent of Contamination and Provided NBC and Medical Analysis and Evaluations.

216 **Table A-10. UJTL Task Analysis Stability Operations and Support Operations Example 2**

	STRATEGIC NATIONAL	STRATEGIC THEATER	OPERATIONAL	TACTICAL
APPLICABLE TASKS	**ST 6.2.8** **Establish NBC Protection in Theater**	**SN 3.4** **Protect Strategic Forces & Means** **SN 1.1.5** **Determine Impact of Threat Climate & Geography on Deployment**	**OP 6.2.8** **Establish NBC Protection in Theater of Operations/JOA** **OP 4.6** **Build and Maintain Sustainment Bases**	**ART 6.2** **Protect Individuals & Systems**
Example 2				
SUPPORTING OR IMPLIED TASKS	Protect Forces & Means Against NBC Threats Provide NBC Protection	Visualize the NBC Battlefield Protect Against NBC Hazards	Provide NBC Protection Assess NBC Threat Detect/Verify NBC Hazard Analyze the Risk	ART 6.2.1.6.2 Identify NBC Hazards ART 6.2.3 Minimize Risks From Battlespace Hazards
ACTIONS	NBC Protection in METL Intel and Risk Assessments Crisis Action Team Decisions Taskings for Resources	NBC Protection in METL Resource Mission Requirements Conduct IPB; Risk Assessment; Vulnerability Analysis	Provide C^2 Task Organize NBC Assets Conduct IPB/Risk Assessment	Appropriate Protective Measures NBC Recon Teams Conduct Missions Teams/C^2 Report Results Conduct IPB/ Risk Assessments

217

APPENDIX B
NBC DEFENSE ASSETS

OVERVIEW

The purpose of the following series of tables is to provide the Fixed Site Commander with a planning tool to identify Service, unit organization, and/or international resources that may be available to contribute to the NBC defense of the base cluster/base. Understand that this appendix does not provide an all inclusive NBC defense listing, but intends to cue planners to additional sources of support to augment organic capabilities. As resource cues, international data referenced from *Jane s NBC Protection Equipment (97-98)*, and has not been verified by the USACMLS or other government agencies. Specific items of NBC defense equipment, as well as the corresponding units' capabilities, are addressed where applicable.

DEPARTMENT OF DEFENSE

Throughout the Department of Defense there are select items of NBC defense equipment that are routinely used by all Services. These common use items consist of individual as well as collective protection systems, and various detection and decontamination devices. The following table depicts items of equipment that could supplement fixed site NBC defense.

Individual Protection Equipment	Description
Nerve Agent Antidote Kits (NAAK)	Auto injector set consisting of atropine and pralidoxime chloride.
Convulsant Antidote, Nerve Agent (CANA) Automatic Injector	Diazepam auto injector.
Pyridostigmine Bromide (PB) Tablets (NAPP)	NAPP- Nerve Agent Pyridostigmine Pre-treatment
Cover, Helmet, CP	Chemical protective helmet cover.
Suit, Chemical Protective: Battle Dress Overgarment (BDO)	Military Standard Chemical-Biological (CB) protective overgarment.
*JSLIST Advanced Battle Dress Overgarment (ABDO)	JSLIST- Joint Service Lightweight Integrated Suit Technology. Will replace current BDO. Launderable up to 4 times. Reduces heat stress. Provides 24 hour CB protection post exposure.
Suit Contamination Avoidance Liquid Protective (SCALP)	Inexpensive, lightweight, disposable. 1-hour CB protection post exposure. Worn over BDO or Combat Vehicle Crewman (CVC) uniform if Chemical Protective Undergarment (CPU) is worn.
Toxicological Agent Protective (TAP) Apron	Impermeable butyl rubber apron.
*Lightweight Chemical Biological Protective Garment (LCBPG)	Compact lightweight garment. Reduces heat stress. Up to seven days of wear. Up to six-hour CB protection post exposure. Not launderable.
*Enhanced Aircrew Uniform Integrated Battlefield (EAUIB)	Lightweight, fire-resistant, CB protective garment for aircrews. 24-hour CB protection, post exposure. Launderable 4 times.
Chemical Protective Undergarment (CPU) *Vapor Protective Flame Resistant Undergarment (VPFRU)	Two piece undergarment. CPU and uniform constitute MOPP1. 12-hour CB protection post exposure. Launderable one time. Lightweight fire resistant undergarment. When worn with uniform, constitutes MOPP2. 12-hour CB protection post exposure. Launderable four times. Includes CB socks. Will replace CPU.
Gloves, CP Rubber	CB protective gloves.
*Improved Chemical-Biological Protective Gloves (ICBG)	Improved dexterity/sensitivity. Flame resistant. Will replace butyl gloves. Up to 30-days wear. Up to 24-hour CB protection, post exposure.
Overboot, Black Vinyl (BVO)	Chemical Protective (CP) overboot.
Overboot, Green Vinyl (GVO)	CP overboot.

Individual Protection Equipment	Description
Cover, Footwear, CP, Rubber	CP footwear covers.
*Multipurpose Overboot (MULO)	Multipurpose Overboot (MULO) will replace GVO and BVO. Up to 24-hour CB protection, post exposure.
Mask, Chemical-Biological Protective: M40 Series	Standard military protective mask. Protects wearer against all known CB agents.
C-2/C-2A1 Filter Canister	Filter element for M40 series Protective Masks.
Collective Protection Equipment	**Description**
M20 Simplified NBC Collective Protection Equipment (SCPE)	Room liner for pre-existing structures with integral filtration and blower system..
Chemical-Biological Deployable Medical System (CBDEPMEDS), M28	Provides CB protection for selected sections of the DEPMEDS equipped hospitals. Room liner for pre-existing structures with integral filtration and blower system. Provides CB protection for selected sections of the DEPMEDS equipped hospitals.
Chemically-Biologically Protective Shelter (CBPS).	A soft shelter system that attaches to the rear of an enhanced capabilities vehicle. Provides CB protection for Battalion Aid stations and medical company treatment facilities. A soft shelter system that attaches to the rear of of an enhanced capabilities vehicle. Provides CB protection for Battalion Aid stations and medical company treatment facilities.
Detection Equipment	**Description**
Alarm, Chemical Agent, Automatic Portable M8A1	Point detector for nerve agent vapors.
*Automatic Chemical Agent Alarm M22 (ACADA)	Advanced point detector. Detects nerve and blister agents. Will replace or complement current M8A1.
Multipurpose Integrated Chemical Agent Alarm (MICAD)	Networking system for NBC detectors, sensors, and alarms. Automates NBCWRS. Formats and transmits NBC 1 and NBC 4 reports.
Chemical Agent Monitor (CAM)	Point detector for nerve and blister agent vapors.
*Chemical Agent Monitor CAM/Improved CAM (ICAM)	Improved point detector for nerve and blister agents. Shorter startup/cleardown times. Interferent resistant.
M8/M9 Chemical Agent Detection Paper	M8 IDs G, V, H; M9 Provides Non-Specific Detection
M18A2 Chemical Agent Detector Kit	Portable chemical agent detection kit. Detects nerve, blister, blood, and choking agents in vapor or liquid form. Primarily used by EOD units.
M256A1 Chemical Agent Detector	Portable, disposable chemical agent detection kit used to detect nerve, blood, or blister agent vapors.
Convulsant Antidote, Nerve Agent (CANA) Automatic Injector	Will replace CPU Diazepam auto injector.
M272 Water Testing Kit	Portable kit used to test for nerve, blood, and blister agent concentrations in raw or treated water.
IM-93 Dosimeter	Tactical, self-indicating gamma total dose instrument. Range 0 - 600 Rad.
Charger, Dosimeter, AN/PP-1578PD	Used to ZERO (Charge) the IM-93 dosimeter.
*RADIAC Set: AN/UDR-13 Pocket RADIAC	Compact gamma, neutron total dose/dose rate instrument. Adjustable alarms. Dose Rate Range 0-999 cGy/hour. Dose 0-999 cGy.

Detection Equipment	Description
AN/VDR-2 RADIAC Set	Lightweight, auto-ranging, portable RADIAC instrument. Used for area surveys and personnel monitoring. Dose Rate Range .01 mrad/hour - 10000 rad/hour. Dose Range 1-1000 rad.
AN/PDR-56 RADIAC Set	Portable scintillation instrument used to detect alpha radiation.
AN/PDR-75 RADIAC Set	Reader for DT236
Decontamination Equipment	**Description**
M258A1 Skin Decontamination Kit, Individual	Individual decontamination kit for skin and personal equipment
M291 Skin Decontamination Kit, Individual	Individual decontamination kit for skin and personal equipment.
M295 Decontamination Kit, Equipment	Replaces M258A1.Decontamination kit for larger items of personal equipment than the M291 can accommodate.
Patient Decontamination, Medical Equipment Set and Chemical Patient, Medical Treatment Set	Non toxic. Provides supplies and equipment for decontamination and medical treatment of NBC patients at medical treatment facilities.
Decontaminating Apparatus 1 1/3 Qt, M11	Refillable DS2 decontaminant dispenser.
M12A1 Power Driven Decontaminating Apparatus (PDDA)	Vehicle mounted, gasoline engine driven decontaminating device.
M13 Decontaminating Apparatus, Portable (DAP)	Non refillable, DS2 decontaminant application system.
Decontaminating Apparatus, Power-Driven, Lightweight (M17)	Portable lightweight power driven decontaminating device.
Modular Decontamination System (MDS), M22	Portable lightweight decontaminating device. Replaces M12A1 and M17 LDS.
Decontamination Material	**Description**
Detergent, General Purpose Liquid	Liquid soap used for decon
Detergent, Wetting Agent (Powder)	Dry substance mixed with calcium hypochlorite when liquid detergent is unavailable to ensure complete wetting of surfaces.
Decontaminating Agent, Super Tropical Bleach (STB)	Standard military bleach based CB decontaminant.
Decontaminating Agent, Calcium Hypochlorite, High Test Hypochlorite (HTH)	Non-standard bleach decontaminant with higher chlorine content used in lieu of STB.
Decontamination Solution (DS2)	Standard military liquid CB decontaminant. Highly corrosive to metal and may soften paint.
Miscellaneous	**Description**
M41 Protection Assessment Test System (PATS)	Portable on-the-face seal verification device for M40 series protective masks.
NBC Marking Set	Portable kit consisting of flags, stakes, crayons, and tape used to mark contaminated areas.
*Joint Warning And Reporting Network (JWARN).	Software system which integrates data from NBC detectors, Meteorological (MET) sensors, Global Positioning System (GPS) receivers, etc. System will analyze information, compile and disseminate appropriate reports

19 **NOTE: *Denotes item under development; not currently fielded.**

ARMY

All Army units are capable of conducting limited NBC Defense operations. These operations consist of, but are not limited to, detection of nuclear and chemical contamination; performing basic decontamination procedures on individuals and equipment; deployment of nuclear and chemical detection devices; and conduct of nuclear and chemical monitoring, survey, and reconnaissance mission operations.

The Army Chemical Corps force structure includes specialized units providing additional capabilities for Nuclear, Biological, and Chemical (NBC) detection, identification, survey, reconnaissance, and thorough decontamination. Chemical Corps units also provide large area smoke and obscurant support to operations.

Chemical Company (Heavy Division)

The Chemical Company (Heavy Division) is capable of providing the following support:

- Four Detailed Equipment Decontamination (DED) sites (52 major items/day/site); Operational Decontamination; Special Decontamination
- Large area smoke (0.2 to 1.1 km wide x several km long, weather dependent); Simultaneous coverage of several small areas when employing smoke generator squads on separate missions
- Radiation monitoring for the nuclear accident and incident control plan (NAICP)
- Chemical detection/monitoring for chemical accident and incident control plan (CAICP)
- NBC Recon (route, area, and zone); surveys, surveillance, and sampling
- NBC staff to division headquarters; operates on 24-hour basis.

The Chemical Company (Heavy Division) is comprised of:

- Division chemical section
- NBC center
- Headquarters section
- Decontamination platoons (4)
- Mechanized smoke platoon (1)
- NBC reconnaissance platoon (1)

The following table depicts the specialized NBC defense equipment organic to this unit:

Decontamination Equipment	Description
Decontaminating Apparatus: High Pressure Washer Module, M22	Washing component of Modular Decontaminating System (MDS).
Decontaminating Apparatus: DS2 Pumper/ Scrubber Module, M21	Decontaminant application component of Modular Decontamination System.
Pump Centrifugal, 65 GPM	Power driven water pump.
Pump Centrifugal, 125 GPM	Power driven water pump.
Tank Assembly, Fabric 500 Gal	Portable fabric water tank.
Tank Assembly, Fabric 3000 Gal Collapsible	Portable fabric water tank.
M12A1, Power Driven Decontaminating Apparatus (PDDA)	Vehicle mounted, gasoline engine driven decontaminating device.
Tank and Pump Unit Liquid Dispensing	M923 series 5-ton truck with two 600-gal water tanks and a integral pump unit.
Detection Equipment	**Description**
Alarm, Chemical Agent, Remote Sensing, M21	Standoff nerve and blister agent detector. Range is line of sight to 5 km.
AN/PDR-56F RADIAC Set	Portable scintillation instrument used to detect alpha radiation.
*Joint Service Lightweight Standoff Chemical Agent Detector (JSLSCAD)	Standoff chemical agent cloud detector. Capable of mobile operation. Range of up to 5 km.

Detection Equipment	Description
NBC Reconnaissance System, M93A1 (FOX)	Vehicle mounted system designed to detect, identify, and mark NBC contamination.
Smoke/Obscurant Systems	**Description**
Generator Smoke, Mechanical, Mechanized Smoke Obscurant System M58	M113A3 tracked vehicle mounted smoke system. Replaces M1059.
Carrier, Smoke Generator, M1059	M113A3 tracked vehicle mounted smoke system.

NOTE: * Denotes item under development; not currently fielded.

Chemical Company (Smoke/Decontamination) Airborne/Air Assault

The Chemical Company (Smoke/Decontamination) Airborne/Air Assault can provide:

- DED sites (3) (Three Thorough (eight tactical vehicles/hour) or six Operational Decontamination Sites.
- Large area smoke screens (3) (each 0.6 - 1.4 km wide x several km long); Smoke Haze up to six kilometers in width and several kilometers long, weather dependent.
- NBC staff support and 24-hour NBCWRS support to each Airborne/Air Assault Division
- Platoon tailoring can respond to needs for both smoke and decontamination support.

The company consists of:

- Division chemical section
- NBC center
- Headquarters section
- Smoke/decontamination platoons (3).

NOTE: Each platoon can support either equipment decontamination or large area smoke; but a platoon can not perform smoke and decontamination simultaneously or immediately switch between missions without transition time. The following table depicts the specialized NBC defense equipment organic to this unit:

The following table depicts the specialized/unique NBC defense equipment organic to this unit.

Decontamination Equipment	Description
Decontaminating Apparatus: High Pressure Washer Module, M22	Washing component of Modular Decontaminating System.
Decontaminating Apparatus: DS2 Pumper/Scrubber Module, M21	Decontaminant application component of Modular Decontamination System.
M17 Lightweight Decontaminating System	Portable lightweight power driven decontaminating device
Tank and Pump Unit Liquid Dispensing	Power driven water pump.
Pump Centrifugal, 65 GPM	Power driven water pump.
Pump Centrifugal, 125 GPM	Power driven water pump.
Tank Assembly, Fabric 500 Gal	Portable fabric water tank.
Tank Assembly, Fabric 3000 Gal Collapsible	Portable fabric water tank.
Smoke/Obscurant Systems	**Description**
Generator Smoke System: Mechanical Motorized, M56	Large area smoke generation system (Mounted on Heavy Variant HMMWV).
Generator Smoke System: M1057	Large area smoke generation system (Mounted on HMMWV)

NOTE: *Denotes item under development item not currently fielded.

Chemical Company (Recon/Decon) Armored Cavalry Regiment (ACR)

The Chemical Company (Heavy Division) is capable of providing the following support:

- NBC reconnaissance (route, zone, area, point, and bypass to locate, identify, mark, and report NBC contamination); NBC surveys, surveillance, and sampling (3 reconnaissance squads/2 reconnaissance teams each)
- DED site (1) (Thorough Decontamination Site 8 – 10 vehicles/hour)
- Operational decontamination sites (3)
- Special decontamination
- Large area smoke (0.6 to 1.4 km wide x several km long) (Smoke Haze: 2 km wide x several km long – weather dependent)
- NBC staff support and 24-hour NBCWRS support.

The company consists of:

- Regimental chemical section
- Headquarters section
- NBC reconnaissance platoons (2)
- Decontamination platoon (1)

The following table depicts the specialized/unique NBC defense equipment organic to this unit.

Detection Equipment	Description
Alarm, Chemical Agent, Remote Sensing, M21	Standoff nerve and blister agent detector. Range is line of sight to 5 km
NBC Reconnaissance System, M93A1 (FOX)	Vehicle mounted system designed to detect, identify, and mark NBC contamination
Decontamination Equipment	**Description**
Decontaminating Apparatus: High Pressure Washer Module, M22	Washing component of Modular Decontaminating System.
Decontaminating Apparatus: DS2 Pumper/Scrubber Module, M21	Decontaminant application component of Modular Decontaminating System
Lightweight Decontaminating System, M17	Portable lightweight power driven decontaminating device.
Tank and Pump Unit (TPU), Liquid Dispensing	M923 series 5-ton truck with two 600-gal water tanks and an integral pump unit.
Pump, Centrifugal, 65 GPM	Power driven water pump.
Pump, Centrifugal;, 125 GPM	Power driven water pump.
Tank Assembly, 3000 Gal, Collapsible	Portable fabric water tank.
Tank Assembly, 500 Gal, Collapsible	Portable fabric water tank.

NOTE: *Denotes item under development; not currently fielded.

Chemical Company (Smoke/Decontamination/Reconnaissance) ACR

The Chemical Company (Armored Cavalry Regiment) is capable of providing the following support:

- NBC reconnaissance (route, zone, area, point, and bypass) to locate, identify, mark, and report NBC contamination; NBC surveys, surveillance, and sampling (3 reconnaissance squads/2 reconnaissance teams each)
- DED site (1) (Thorough Decontamination Site 8 – 10 vehicles/hour)
- Operational decontamination sites (3)
- Special decontamination
- Large area smoke (0.6 to 1.4 km wide x several km long) (Smoke Haze: 2 km wide x several km long – weather dependent)
- NBC staff support.

The company consists of:

- Regimental chemical section
- Headquarters section
- NBC reconnaissance platoon (1)
- Smoke/decontamination platoon (1).

NOTE: As before, the dual-purpose platoon can only support a smoke **or** decontamination mission at any one time.

The following table depicts the specialized NBC defense equipment organic to this unit.

Detection Equipment	Description
Alarm, Chemical Agent, Remote Sensing M21	Standoff nerve and blister agent detector. Range is line of sight to 5 km.
NBC Reconnaissance System, M93A1 (FOX)	Vehicle mounted system designed to detect, identify, and mark NBC contamination.
Decontamination Equipment	**Description**
Decontaminating Apparatus: High Pressure Washer Module, M22	Washing component of Modular Decontamination System.
Decontaminating Apparatus: DS2 Pumper/Scrubber Module, M21	Decontaminant application component of Modular Decontamination System.
Lightweight Decontaminating System, M17	Portable lightweight power driven decontaminating device.
Tank Assembly Fabric, 500 Gal Collapsible	Portable fabric water tank.
Tank Assembly Fabric, 3000 Gal Collapsible	Portable fabric water tank.
Tank and Pump Unit (TPU), Liquid Dispensing	M923 series 5-ton truck with two 600-gal water tanks and an integral pump unit.
Pump, Centrifugal, 65 GPM	Power driven water pump.
Pump, Centrifugal, 125 GPM	Power driven water pump.
Smoke/Obscurant Systems	**Description**
Generator Smoke System: Mechanical Motorized, M56	Large area smoke generation system (Mounted on Heavy variant HMMWV).
Generator Smoke System: M1057	Large area smoke generation system (Mounted on HMMWV).

NOTE: * Denotes item under development; not currently fielded.

Chemical Company (Decontamination) Corps/Theater Army (TA)

The chemical company (Decontamination) Corps/Theater Army is capable of providing the following decontamination support to units in a corps' rear area, the communications zone (COMMZ) or a division's area of operations (AO) as well as specialized decontamination support such as aircraft or terrain decontamination:

- DED sites (5) simultaneously (8 vehicles/hour/site).

The company consists of:

- Headquarters section
- Maintenance section
- Decontamination platoons (5).

The following table depicts the specialized/unique NBC defense equipment organic to this unit.

Decontamination Equipment	Description
Decontaminating Apparatus: High Pressure Washer Module M22	Washing component of Modular Decontamination System.
Decontaminating Apparatus: DS2 Pumper/Scrubber Module M21	Decontaminant application component of Modular Decontamination System.
Power Driven Decontaminating Apparatus (PDDA), M12A1	Vehicle mounted, gasoline engine driven decontaminating device.
Tank and Pump, Unit Liquid Dispensing	M923 series 5-ton truck with two 600-Gal water tanks and a integral pump unit.
Pump Centrifugal, 65 GPM	Power driven water pump.
Pump Centrifugal, 125 GPM	Power driven water pump.
Tank Assembly, Fabric 500 Gal	Portable fabric water tank.
Tank Assembly, Fabric 3000 Gal Collapsible	Portable fabric water tank.

NOTE: * Denotes developmental item not currently fielded.

Chemical Company (NBC Reconnaissance) Corps/Theater Army (TA)

The Chemical Company (Recon) Corps/Theater Army is capable of providing the following support:

- NBC reconnaissance (route, zone, and area, point, and bypass) to locate, identify, mark, and report NBC contamination
- Conventional reconnaissance (route, area, and zone) (Capability is reduced after NBC weapons use.)
- Can conduct NBC reconnaissance, surveys, surveillance, sampling, and may also locate potential decontamination sites
- Radiation monitoring for NAIRA (Nuclear Accident Incident Response Assistance)
- Chemical detection for CAIRA (Chemical Accident Incident Response Assistance).

The company consists of:

- Headquarters section
- NBC reconnaissance platoons (3) with four reconnaissance squads each/two reconnaissance teams each.

The following table depicts the specialized/unique NBC defense equipment organic to this unit.

Detection Equipment	Description
Alarm, Chemical Agent, Remote Sensing, M21	Standoff nerve and blister agent detector. Range is line of sight to 5 km.
NBC Reconnaissance System, M93A1 (FOX)	Vehicle mounted system designed to detect, identify, and mark NBC contamination.

Chemical Company (Biological Detection) Corps

The Corps Chemical Company (Biological Detection) is capable of providing the following support:

- Detection of large area biological aerosols
- (Presumptive) Identification of biological warfare (BW) agents
- Collects aerosol samples for laboratory analysis.

The company consists of:

- Headquarters section
- Five Biological detection platoons/Biological Detection Company. (Seven Biological Integrated Detection Systems(BIDS) Teams/Platoon)
- Long range biological standoff detection (LRBSDS) detachment.

The following table depicts the specialized NBC defense equipment organic to this unit.

Detection Equipment	Description
Alarm, Biological Agent, Automatic: Integrated Detection System, BIDS, M31E1	Detects biological agents. Identifies multiple BW agents. Collects samples.
Long Range Biological Standoff Detection System (LRBSDS)	Detects aerosol clouds. Distinguishes natural from manmade events.

Chemical Team LA (Recon)

The Chemical Team LA (Recon) is capable of providing:

- NBC reconnaissance (route, area, zone, and point) support to separate brigades and theater defense brigades.
- Collects environmental samples
- Collects Examines and IdentifiesNBC contamination. Limited capability to evaluate data.

The following table depicts the specialized NBC defense equipment organic to this unit:

Detection Equipment	Description
Alarm, Chemical Agent, Remote Sensing, M21	Standoff nerve and blister agent detector. Range is line of sight to 5 km.
NBC Reconnaissance System, M93A1 (FOX)	Vehicle mounted system designed to detect, identify, and mark NBC contamination.

Chemical Team LB (Reconnaissance) (Special Forces)

The Chemical Team LB (Reconnaissance) (Special Forces) is capable of providing:

- NBC reconnaissance support to Special Forces (SF) units. Uniquely suited for rapid world-wide deployment.
- Collects/Identifies/documents NBC contamination
- Expertise in enemy NBC systems, employment tactics, techniques, and procedures
- Specialized NBC protective equipment
- Expertise in friendly, coalition, and allied forces NBC systems, employment tactics, techniques, and procedures.

Chemical Team JA (NBC Element)

The Chemical Team JA (NBC Element) is capable of providing:

- NBC staff support to augment separate brigades, corps, theater defense brigades, theater armies, and unified commands. Organized to provide staffing for one 12-hour shift. (5 personnel).
- NBC Warning and Reporting System (NBCWRS) monitoring
- Monitoring of NBC assets.

Chemical Team JB (NBC Element)

Capabilities are identical to the JA team, but the unit is organized to provide two 12-hour shifts. (10 personnel).

OTHER ARMY UNITS

In addition to units that specialize in NBC defense, there are other types of units that are capable of making significant contributions to fixed site NBC defense operations.

The following table provides examples of these types of units and their respective capabilities.

UNIT TYPE	EQUIPMENT	CAPABILITIES
Combat Engineer	Earth Moving Dump Trucks Road Graders Small Emplacement Excavators Cranes 600 GPM pumps 125 GPM pumps Trucks	Capable of providing assistance with terrain decontamination operations (e.g., covering and clearing, as well as decontamination site preparation). Earth hauling/excavation. Capable of providing significant quantities of potable water.
Quartermaster	Water Purification Water storage tanks Trucks Large Volume Water Tankers	Capable of providing assistance with terrain decontamination operations (water storage and delivery) Water hauling and pumping capabilities.
Technical Escort	TAP Suits M18A2 Chemical Agent Detection Kits	Capable of planning and performing emergency neutralization and subsequent disposal of chemical agents. Response and neutralization of hazards resulting from chemical accident/incident situations (CAIRA) and nuclear accident/ incident situations (NAIRA). Escorting hazardous cargo/material.
Preventive Medicine Detachments/Staffs	Water Testing Kit, M272. Preventive Medicine Water Quality Control set Preventive Medicine Industrial Hygiene Surveillance Equipment	Capable of conducting surveillance on water sources and supplies for potential NBC contamination and providing recommendations to commanders on techniques for providing safe drinking water under NBC conditions. Conducts surveillance for toxic industrial chemicals (TIC), potential operational facilities/ areas that may produce TIC hazards.

UNIT TYPE	EQUIPMENT	CAPABILITIES
Area Medical Laboratory	NBC agent identification equipment, Endemic/Epidemic disease surveillance and analysis equipment	Provide in theater initial identification of NBC agents. Provides industrial hygiene and occupational health laboratory support on verification of TIC
Veterinary Services	Food quality assurance testing medical set	Provides food surveillance and quality assurance to include potential NBC contamination surveillance.
Aviation	OH 58A/C/D UH-1 UH-60 CH-47	Capable of providing assistance/platforms for the detection of NBC agents. Additionally, UH60 provides platform for LRBSDS.
Explosive Ordnance Disposal	TAP Suits M18A2 Chemical Agent Detection Kits	Capable of detecting, identifying, rendering safe, evacuating, and disposing of conventional, as well as improvised chemical, biological or nuclear weapons.

AIR FORCE

NBC defense in the Air Force is focused on the three key areas of avoidance, protection, and decontamination. All members receive training in basic NBC defense procedures. This training provided by Civil Engineer Readiness Flight personnel consists of classes on Attack Actions, Warning and Reporting, Individual Protective Equipment, Collective Protection, Personal Decontamination, and Contamination Control Procedures. Additionally, Air Wings designate personnel within their units to serve on special teams that support installation NBC defense. These teams, known as Shelter Management Teams (SMT), Contamination Control Teams (CCT), and Disaster Preparedness Support Teams (DPST) provide the base with support in the areas of NBC decontamination, detection, and survey operations. The following table depicts items of NBC defense equipment unique to the Air Force.

Individual Protection Equipment	Description
MCU-2A/P Series Protective Mask	NBC protective mask with single clear urethane lens facepiece and two voicemitter assemblies.
Collective Protection Equipment	**Description**
Survivable Collective Protection System II	Modular concrete collective protective shelter with integral overpressure and filtration systems..
KMU-450F Building Modification Kit	Overpressure/filtration system for pre-existing structures/buildings.
Detection Equipment	**Description**
AN/PSR-2 Automatic Liquid Agent Detector	Portable point detector for fixed installations, (e.g., airfields). Detects liquid concentrations of GD, VX, HD, and L.
M90 Chemical Warfare Agent Detector	All-purpose chemical agent vapor detector. Detects vapor concentrations of blood, blister, and nerve agents. Can also be used to monitor contaminated surfaces using intake tubes.
Automatic Mustard Agent Detector	Information TBP
ADM 300 Multifunctional Radiation Detection Instrument w/Probes	Auto-ranging RADIAC instrument designed to detect alpha, beta, and gamma radiation.

Decontamination Equipment	Description
Fullers Earth	Absorbent powder decontaminant.
Miscellaneous	**Description**
Multiman Intermittent Cooling System and Voice Enhancers	Impermeable ventilated environmentally controlled protective ensemble designed for personnel involved in aircraft launch operations - sortie generation. Unit is tethered to filter/pressurization component.

Readiness Flights

The Civil Engineer Readiness Flight is the organization that is responsible for all actions and measures taken to protect air base resources from the effects of attack, natural disasters, and major accidents, as well as restoring these resources following disasters. Additionally, they provide specialized training to SMT, CCT, and DPST members. Readiness Flight is a component of the Prime BEEF Team.

Prime Base Engineer Emergency Force (Prime Beef) Teams

Comprised of approximately 143 personnel and designed to support an Air Force Wing, these mobile combat support organizations are capable of deploying worldwide on 24-hour notice to meet contingency requirements. The teams consist of highly skilled personnel and are designed to support a wide variety of missions from fire suppression to protecting base resources from conventional, nuclear, biological, and chemical attack. The following table depicts the specialized equipment organic to this unit.

Equipment	Remarks
Power Production	Power generation equipment.
Civil Engineer Control Set	Team checklists for decontamination, fire protection, rapid runway repair, and major accident response.
Structures Sets	Tools and materials suitable for the construction of covers/sheds.
Pest Management Sets	Respirators, Protective Clothing, Vector Control Equipment.
Fire Fighting Clothing Sets	High Pressure/Volume Fire Fighting Equipment, Self-Contained Breathing Apparatuses (SCBA).

Rapid Engineer Deployable Heavy Operational Repair Squadron Engineer (RED HORSE) Squadrons

Air Force RED HORSE squadrons are mobile, rapidly deployable, self-sufficient units. They are capable of providing airfield and base heavy construction/repair along with the special capabilities of environmental clean-up, hazardous materials/waste spill response. These squadrons consist of approximately 400 personnel and over 1800 tons of vehicles, heavy construction, and support equipment. Organized into three deployment echelons designated RH-1, RH-2 and RH-3, each echelon is unique with its own personnel and equipment. RH-1 units are deployable within 12-hours of notification, RH-2 within 48-hours of notification, and RH-3 within 6-days of notification. The following table depicts the specialized/unique equipment organic to this unit.

Equipment	Remarks
Crane, 15-Ton Loader, Scoop Loader, 2 1/2 yard^3 Excavator	Equipment for support of large-scale decontamination operations/procedures. (e.g., terrain decontamination, sealing, covering, clearing, removing). Equipment to support the establishment

Equipment	Remarks
Rock Drill Crawler Well Drilling Machine Trailer, Light, 6-Ton Sweeper Mixer, Roto (Concrete Mixer) Roller, Vibrating Forklift, 10-Ton Truck, 20-Ton Tractor, IW - 70 Truck, Tractor Truck, 14 yard^3 Trailer, 50-Ton Dozer, T-7 Dozer, T-9 Truck, M35 Crush Trailer Cleaner, Vac	of decontamination sites or modification of existing facilities to support decontamination operations. (e.g., wash racks, rail yards)

NAVY

The Navy does not operate using specialized NBC defense units. Personnel required to function in this area are drawn from existing job specialties. Naval units will generally posses only enough NBC equipment and consumables for their own support. The Navy addresses NBC defense in two primary areas: Units Afloat and Units Ashore. Shipboard units have repair parties and teams capable of conducting limited NBC detection, decontamination, and contamination control operations on-board their assigned vessel. Shore-based units have disaster preparedness teams capable of providing more comprehensive assistance in the form of organized and equipped teams. In addition to these disaster preparedness teams, Naval Construction Forces and their associated engineer equipment may provide assistance with contamination control based on mission priorities. The following table depicts items of NBC defense equipment unique to the Navy.

Individual Protection Equipment	Description
Tetracycline Hydrochloride Capsules	Antibiotic
MCU-2/P Series Protective Mask	NBC protective mask with single clear urethane lens facepiece and two voicemitter assemblies.
MCK-3A/P Protective Mask	Naval aviator NBC protective mask.
A/P22P-9A (V) Above-the-Neck Respirator Assembly	Naval Aircrew protective ensemble consisting of MCK-3A/P mask with hood, facepiece, ventilator, and intercom set.
A/P22P-9A (V) Below-the-Neck Protective Assembly	Naval Aircrew protective ensemble consisting of a chemical liner, undershirt, drawers, socks, footwear covers, cape, gloves and inserts.
Collective Protection	**Description**
Collective Protection Systems (Ships)	Installed shipboard ventilation/filtration system. Channels filtered air to selected zones.
Detection Equipment	**Description**
Phosgene Draeger Tubes	Detector tubes used to test for phosgene gas.
AN/PDR-65/AN/PDR-65A RADIAC Set	Gamma radiation detection instrument.
Detector, RADIAC, Dosimeter DT-60C/PD	High range personal dosimeter.
Computer Indicator (Reader) CP-95A/PD	Reader unit for DT-60C/PD.

Detection Equipment	Description
AN/KAS-1A Chemical Warfare Directional Detector	Shipboard mounted or portable standoff nerve agent cloud detector.
Chemical Agent Point Detection System	Shipboard hard-wired nerve agent detection system.
Dosimeter, High Range Indicating, IM-107 P/D	Tactical dosimeter.
Dosimeter, Low Dose Indicating, IM-9 (H) PD	Laboratory dosimeter.
IM-143B/PD Pocket Dosimeter	Self-indicating, pocket dosimeter. Gamma, total dose. Range 0 - 600 roentgens.
Charger, Dosimeter, PP-4276 (C) PD	Charger for IM-143B/PD. Charges the IM-143B/PD to 0 (ZERO)
Survey Meter, Beta-Gamma, High Range AN/PDR-43	Beta-gamma RADIAC instrument. Measures gamma on three scales 0 - 5, 0 - 50, and 0 - 500 roentgens/hour. Similar to AN/PDR-27 RADIAC instrument.
Decontamination Equipment	**Description**
Countermeasure Washdown System (CMWDS)	Sprinkler system that provides a moving screen of sea water over the surfaces of the ship.

Naval Mobile Construction Battalion (NMCB)

Equipment	Remarks
Truck, Dump 15-Ton. Mixer, Concrete Distributor, ASP Distributor, Water (Water Tanker) Roller, Vibrating Dozer Grader, Motorized Loader, 2.5 yard^3 Loader, Scoop Roller, Motorized Scraper Drill, Well Decontamination Kit 500 Gal. (M12A1 PDDA) Crane, Tracked, 35-Ton Crane, Wheeled, 14-Ton Excavator Forklift	Equipment for support of large-scale decontamination operations/procedures. (e.g., terrain decontamination, sealing, covering, clearing, removing). Equipment to support the establishment of decontamination sites or modification of existing facilities to support decontamination operations. (e.g., wash racks, rail yards)

Naval Construction Force Support Unit (NCFSU)

Equipment	Remarks
Truck, Dump Semi-trailer, Dump Crane, Crawler, 60-Ton Scraper Truck, Tractor Crusher, Rock Loader, Wheeled Dozer Semi-trailer, LB, 35-Ton Paver, Asphalt Roller Crane, Wheeled, 12.5-Ton	Equipment for support of large-scale decontamination operations/procedures. (e.g., terrain decon, sealing, covering, clearing, removing) Equipment to support the establishment of decontamination sites or modification of existing facilities to support decontamination operations (e.g., wash racks, rail yards)

MARINE CORPS

With the exception of the Chemical Biological Incident Response Force (CBIRF), the Marine Corps does not use structured NBC defense units. USMC capabilities in this appendix are based on unit equipment and individual/collective training. Marines receive training in NBC detection, protection, and decontamination operations. USMC NBC defense personnel include warrant officers (MOS 5702) and NBC Specialists (MOS 5711) who are responsible for manning NBC control centers, training units, and maintaining NBC equipment. Personnel intensive tasks such as unit decontamination and NBC reconnaissance operations are performed as an additional duty by Marines from within the unit. The following table depicts specialized items of NBC defense equipment within the Marine Corps.

Individual Protection Equipment	Description
AR-5 Series Protective Mask	NBC protective mask for aviators fixed and rotary wing.
MCK-3A/P Protective Mask	
Chemical Protective Overgarment (Saratoga Suit)	Two piece CP suit consisting of a jacket with integral hood and trousers. Provide 24-hour CB protection post exposure. Launderable 4 times.
Suit, Contamination Avoidance and Liquid Protective (SCALP)	Inexpensive, lightweight, disposable. Up to one-hour CB protection, post exposure. Worn over BDO or CVC if CPU is worn.
MK-1 Aviator Protective Suit	Marine aviator CB protective suit.
A/P22P-9A (V) Above-the-Neck Respirator Assembly	Marine Aircrew protective ensemble consisting of MCK-3A/P mask with hood, facepiece, ventilator, and intercom set.
A/P22P-9A (V) Below-the-Neck Protective Assembly	Marine Aircrew protective ensemble consisting of a chemical liner, undershirt, drawers, socks, footwear covers, cape, gloves, and glove inserts.
Coveralls, Toxicological Agent Protective, Nylon Twill.	Impermeable CB protective coveralls.
Mark IV Protective NBC Suit.	Two piece flame resistant CB Protective suit.
Collective Protection Equipment	**Description**
Portable Collective Protection System (PCPS)	Mobile collective protective shelter. Consists of shelter, support kit, and filter. Accommodates 12 to 14 personnel.
Transportable Collective Protection System (TCPS)	Field expedient deployable shelter system. Designed to interface with other shelter systems or operate as a stand-alone system.
Detection Equipment	**Description**
Individual Chemical Agent Detector (ICAD)	Miniature lightweight, chemical agent detector. Detects nerve, blood, blister, and choking agents.
IM-143B/PD Pocket Dosimeter	Tactical self-indicating dosimeter.
Decontamination Equipment	**Description**
M280 Decontamination Kit, Individual Equipment (DKIE)	Decontaminating kit designed for decontamination of items of individual equipment (e.g., mask, hood, weapon).

Chemical/Biological Incident Response Force (CBIRF)

The Chemical/Biological Incident Response Force (CBIRF) is the only structured NBC defense unit in the Marine Corps. Comprised of approximately 350 Marines and sailors, the unit is capable of providing NBC reconnaissance, personnel/casualty decontamination, medical support and expert advice through the

Electronic Reachback Advisory Group (ERAG). The ERAG is an organization chartered to assist with the development, training, and operations of the CBIRF. It is composed of eight nationally and internationally recognized civilian experts in science and medicine. The ERAG is self-contained, self-sufficient, and rapidly deployable worldwide. The following table depicts the specialized/unique NBC defense equipment organic to this unit.

Decontamination Equipment	Description
Specialized Shower System	TBP
Detection Equipment	**Description**
Alarm Chemical Agent, Remote Sensing M21	Standoff nerve and blister agent detector. Range is line of sight to 5 km.
Reconnaissance System, NBC M93A1 FOX	Vehicle mounted system designed to detect, identify, and mark NBC contamination.
Miscellaneous Equipment	**Description**
Reverse Osmosis Water Purification Units (ROWPU)	Water purification system capable of treating water from any available source. Will remove NBC contaminants. Powered by a 30 kW generator. Production Rate: Seawater source: 600 GPH. Fresh water source: 1800 GPH.

Marine Expeditionary Force (MEF)

The MEF is the Marine Corps principal warfighting organization. It consists of a combination of air, ground, and support assets. These units can range in size from less than one infantry division to multiple infantry divisions and aircraft wings. NBC control centers are formed at all levels of command down to battalion/squadron level, and are manned by trained Marine Corps personnel. The MEF is capable of conducting NBC detection, reconnaissance, and decontamination operations.

Infantry Division - TBP

Force Service Support Group (FSSG) - TBP

Surveillance, Recon, And Intelligence Group (SRIG) - TBP

Marine Air Wing (MAW) - TBP

ALLIED/COALITION ASSETS

General Overview

The fixed site commander must demonstrate the ability to use all available resources to support potential contingencies. Apart from DOD, the armed forces of most potential allied/coalition partners currently possess significant quantities of specialized decontamination, detection, and protection equipment as well as various types of decontaminants. The following tables have been extracted from ***Jane s NBC Protection Equipment, 1997 98***. Equipment capability has not been further validated by the USACMLS or CBDCOM, Aberdeen Proving Ground, MD. The tables provide a categorized list of equipment by selected country.

North Atlantic Treaty Organization (NATO)

CANADA

Individual Protection Equipment	Description
Protective Coverall	One piece garment with attached hood worn in place of combat uniform.
ACTON NBC lightweight overboots	Used in Australia, UK. Lightweight CP overboots.
NBC overboots, Mark 5	Used in Australia, UK. CP overboots.
Collective Protection Equipment	**Description**
ARO Aircrew Respirator System	In production.
ARO Ventilated Respirator System (VRS)	Vehicle-mounted, variable-speed filtration system.
Detection Equipment	**Description**
DRES Chemical Agent Detection System	CAM network (up to eight) with central control station and monitoring stations remoted to 4 km.
Detector Kit, Chemical Agent (C-2)	Detects/Identifies G and V series nerve agents, blood agents, and choking agents. Kit contains M8 detector paper. Similar to US M256A1
Chemical Agent Liquid Detector Paper - 3-way M-8 and M-9	Detects/Identifies G and V series nerve, and H series blister agents.
Detector, Chemical Agent, Nerve Vapor	Nerve agent vapor detector.
Detector Kit, Chemical Agent, M256A1	Same as US M256A1
RADIAC Set, Remote Monitoring, and Alarm, AN/FDR-502(V)	Sensor networked gamma detector for fixed or semi-fixed installations. Detects gamma at 1 - 5000 rad/hour.
Radiacmeter, IM-5016/PD	In service with Canadian Armed Forces. Detects and measures gamma radiation. Displays readings in rad/hour on analog dial from (1 to 10 rad/hour).
Radiacmeter, IM-108S/PD	Gamma radiation detector measuring gamma at 0 - 500 rad/hour.
Radiation Monitor and Automatic Alarm, AN/GDQ-3	Gamma radiation detector network for fixed or semi-fixed sites. Measures gamma at 1 - 5000 rad/hour.
Gamma Survey Meter, Model 189	Measures X-ray and gamma radiation.
Decontamination Equipment	**Description**
NBC-DEWDECON-2L Decontamination Device	2-liter DS2 application device. Similar to US M11.
NBC-DEWDECON-3L Decontamination Device	In service with Australia, Canada, Saudi Arabia, and other nations. 3-liter DS2 application device, pressurized by hand or air compressor.
NBC-DEWDECON-20L Decontamination Device	Australia, Saudi Arabia, and other nations. 20-liter pressurized device for C8-C decontaminant or optional DS2 decontaminant application.
NBC-DEWDECON-M Decontaminant Mixer/ Dispenser	Decontaminant mixer/dispenser with high pressure water system.
NBC-DEWDECON-PERS Emergency Response Personnel Decontamination Kit	Civilian police, fire fighters, ambulance crews, and civil defense teams. For general decontamination of nerve and blister agents.
Skin Decontaminant Lotion	Neutralizes mustard, nerve agents, and lewisite on contact.
Miscellaneous	**Description**
Carleton NBC belt-mounted respiratory system	Battery-powered positive-pressure system designed for use with the C4 protective mask.

Miscellaneous	Description
Zenon Advanced Double Pass Reverse Osmosis Water Purification Unit (ADROWPU)	Self-contained large volume water purification unit capable of processing NBC contaminated water. Relies on integral 40 kW diesel power generator.
NBC-DEWPRO-TEK Protective Material	NBC protective material for covering supplies and equipment. Resists liquid mustard penetration for a minimum of 24-hrs.

331
332
333

FRANCE

Individual Protection Equipment	Description
Giat NBC Hood for Civilians	Protects face and respiratory tract from chemical agent vapors.
NBC Protective Suit, Model S3P	Used in Swiss Army also. Two piece CP over-garment system.
Protective Coverall, Model T3P	French Air Force air and ground crews. One piece CP coverall system with integral hood.
NBC/F Protective Coverall	Tank and helicopter crews. Similar to T3P w/o hood.
Paul Boy'e Tropical NBC Combat Suit	In production for the French Army. Two-piece lightweight CP overgarment system with integral hood.
Paul Boy'e Lightweight Decontamination Suit	Lightweight one- or two-piece suit. Reusable after up to 4 to 5 decons.
Bachmann, Model 63, Disposable NBC Suit	Full-length outer garment, gloves, head cowl, overboots, and spare gloves. Designed for short-term emergency use.
Bachmann, Heavy Duty NBC Decontamination Suit	Heavy-duty butyl-based fabric.
Collective Protection Equipment	**Description**
AMF 80 Modular NBC Shelters	Canadian Forces Europe. Prefabricated shelter capable of housing up to 60 occupants. Comprised of 2 and 2.5 meter diameter modules connected by neoprene joints. Usually constructed in a trench and covered by a layer of earth. Self-supporting for 7-days.
AP 60 Modular Semi-hardened Shelter	Similar to AMF 80 but self-supporting for 48-hours.
Bachman NBC Shelters	NBC shelters typically for field repair facilities. Capable of accommodating vehicles or aircraft.
TMB Collective NBC Protection Tent	Personnel shelter, impermeable for up to 24-hours, positive overpressure and filtration system.
FMGC High Capacity, Composite Filter	Filtration unit for collective protective shelters.
Sofiltra-Poelman NBC Filters	NBC Filter unit.
Giat NBC Filtering and Pressurization Unit for Soft-Skin Structures	Filtration/Pressurization unit for soft skin structures and mobile shelters.
Giat NBC EVATOX emergency evacuation kit.	Kit designed for evacuation of the public from an area with a known toxic atmosphere. Contains I000 protective respiratory hoods for adults and children as well as 7 infant protection systems.
Detection Equipment	**Description**
PROENGIN Portable Contamination Monitor, AP2C	Similar to US Chemical Agent Monitor (CAM)
Chemical Detection Unit for Fixed Installations (ADLIF)	Point detector for G, V and H series agents.
Giat NBC Chemical Detection Control Kit (TDCC)	Can detect most nerve, blood, and choking agents.

Detection Equipment	Description
Giat NBC Toxic Agent Detection and Identification Kit	In production. Detects toxic agents in atmosphere or on materials.
Giat NBC Detalac mle F1 and mle F2	mle-Model. Point nerve agent detection system. Similar to US M8A1.
Giat NBC DET INDIV mle F1 Individual Nerve Agent Detector	Individual nerve agent detection system for G series agents.
Gait NBC Adhesive Detector Paper, PDF1	Similar to M8 paper with adhesive backing.
Decontamination Equipment	**Description**
Chemical Decontamination Glove mle F1	Personal decontamination device for skin, clothing, and equipment.
Giat NBC Decontamination Appliance, Emergency, 2.5-liters	Similar to US M11.
ACMAT UMTH 1000 Vehicle-Mounted Decontamination System	Vehicle-mounted decontamination system, with equipment platform, fixed hydraulic equipment, motorized pump, 3000-liter water tank, and a removable hot water/steam generator. Air-transportable by C-130 aircraft.
Miscellaneous	**Description**
NBC Casualty Bag	NBC protective bag with air filter generator. Provides casualty protection for up to 8-hours.
Giat NBC ventilated casualty hood.	Transparent NBC protective hood for casualties.
Giat NBC individual survival kit.	Fabric wallet containing various detector papers, nerve agent vapor detectors, decontamination gloves, pyridostigmine pre-treatment tablets, and two to three MultiPen or ComboPen, autoinjectors.

GERMANY

Individual Protection Equipment	Description
Helsa-Werke NBC Facelet	Used during rest or stand-by periods when full protection is not necessary.
Helsa-Werke NBC Protective Clothing	Used by Norway, Sweden, Germany and some Middle East Forces. Integral hood, jacket, overtrouser, overboots, and gloves.
Karcher Combat Suit with Integrated NBC Protection System, Safeguard 3002	Used by Saudi Arabia and several other Middle East countries. Integral hood, jacket, and trousers. Worn in place of combat uniform.
Karcher Flying Suit with Integrated NBC Protection System, Safeguard 3002/A	Fire resistant NBC protective garment.
Karcher Impermeable NBC Suit, Safeguard 6004	One-piece, gas-tight, full protective suit with integrated boots and mask.
Collective Protection Equipment	**Description**
Karcher SPS 2000 long-term conservation system	Used in Saudi Arabia. Dual tent storage system consisting of an inner and outer tent and a dehumidifier. Designed for storing equipment in a humidity-controlled environment.

338

Detection Equipment	Description
Honeywell-ELAC Chemical Agent Detection System, A2	Personal and point detection/alarm unit for nerve, blood, blister, and choking agents. Adaptable for fixed site networks.
Honeywell-ELAC Mustard Module	Used by Austrian Armed forces. Used with US M43A1 detector to detect blister, blood, and choking agents.
MM-1, Mobile Mass Spectrometer	Used by Israel, Thailand, Turkey, and the US. Detects chemical agent vapors and liquids. Incorporated in US Army and Marine Corps M93A1 NBC Reconnaissance Systems (FOX).
Transportpanzer-1 'Fuchs' NBC Reconnaissance Vehicle	US, British, and Israeli forces. See US M93A1 NBC Reconnaissance System (FOX).
Decontamination Equipment	**Description**
Mobile NBC Decontamination Semi-trailer	Mobile decontamination facility for equipment and clothing. Items are processed on conveyor belt thru a series of heat, steam, decontaminant application, and rinsing processes. All contaminated run off is contained in integral tanks. Water is supplied by internal 800-liter tank and for long-term operations, by a water tanker vehicle via hoses.
Karcher Material, Terrain, Personnel Decontamination System (2 Trucks)	Used by Austrian forces. Two truck system. One for decontamination of material and terrain. One for decontamination of personnel and personal equipment. Each vehicle has its own integral 2000-liter water tank.
Karcher Decojet Decontamination System	Used by French, Middle East, and Portuguese forces. Mobile, self-contained, vehicle-carried, frame-mounted decontamination system with integral 200- and 435-liter water tanks. Capable of decontaminating personal, equipment, material, and clothing.
Karcher Decojet-trailer Decontamination System	Used by Australia, Austria, Portugal, Middle East, and some countries in North Africa. Mobile decontamination system mounted on a 4-ton trailer. Provides personal, equipment, material, clothing, terrain, and building decontamination capability.
Karcher DECOCONTAIN Decontamination System	Used by Portuguese Air Force. Self-contained, complete decontamination system for vehicles, aircraft, personnel, terrain, clothing and equipment. Also capable of processing water contaminated by NBC agents into drinking quality water.
Karcher DT60 Decontamination Tent	Double-walled tent comprised of inflatable tubular frame with integral air compressor.
Karcher Decontamination Tent	Decontamination tent with inflatable frame.
Karcher C8-DADS Direct Application Decontamination System	Used by Australia, Austria, Egypt, France, Taiwan, Thailand, NATO Headquarters. DADS- Direct Application Decontamination System. Capable of mixing and applying decontaminant solution. Used in terrain, vehicle, and aircraft decontamination operations. Similar to US M17 LDS.

339

Decontamination Equipment	Description
Karcher MPDS Multipurpose Decontamination System	Used by Austria, Australia, NATO Headquarters, Portugal, and countries in the Middle East and North Africa. High pressure steam cleaning system in a light metal frame. Similar to US M17 LDS.
Karcher Portable Lightweight Decontamination System DS 10	Used by Austria, Belgium, Norway, Sweden and countries in the Middle East. Ten-liter pressurized decontaminant mixer/applicator. Similar to US M13 DAP.
Karcher HDS 1200 EK Pressure Steam Jet Cleaner Unit	In use by 40 Armed Forces worldwide. Steam cleaner.
Karcher SCS 1200 DE Lightweight Decontamination System	Used in Africa, Europe, and US. Frame-mounted steam cleaner modified for military use. Used to decontaminate vehicles, equipment, aircraft and personnel. Similar to US M17 LDS.
Karcher SCS 1800 DE Decontamination System	Used in Europe. High performance, self-contained, decontamination module. Used for mixing and applying decontaminant solutions.
Karcher Decontamination Accessories: MPS 3200 Motor Pump Set; Field Shower Unit; Showerjet 15 Collapsible Water Tank 2500-Liters	MPS 3200 - NATO Headquarters, Australia, Austria, Portugal, and some North Africa and Middle East countries. Field Shower Unit and Collapsible Water Tank - several countries. Showerjet 15 - UK and New Zealand. MPS 3200 - Motor Pump Set. Used for water application, seawater resistant. Field Shower Unit - Two-stage shower unit for personnel decontamination. Showerjet 15 - Capable of decontaminating up 15 personnel simultaneously when attached to Karcher MPDS, HDS 1500D or HDS 1200 hot water high pressure modules. Collapsible Water Tank – 2500-liter capacity.
Karcher Decontamination and Cleaning Agents: RM 21 RM 31 RM 32 RM 35 RM 54 Calcium Hypochlorite-C8 C8 emulsion component TDE 202	In use worldwide. RM 21- Liquid personnel decontamination solution. RM 31- Liquid alkaline agent for cleaning unpainted surfaces. RM 32- Liquid alkaline cleaner for industrial applications. RM 35- Disinfecting cleaner for industrial applications. RM 54- Foam cleaner for sensitive weapon systems. Calcium Hypochlorite-C8 - Decontaminant powder with 64% available chlorine. C8 emulsion component - A mixture of tetrachloroethylene and emulsifier PTC 2000. A component of Munster emulsion. TDE 202 - Decontaminant emulsion that is effective on all known chemical warfare agents and mixtures of agents.
Karcher Hot Air Generator FB 60 E	Used by Australian and US forces. Hot air decontamination device.
OWR DEKON Decontamination System	Mobile decontamination system consisting of the following five basic components: DETECT 1000 - Air-conditioned, overpressurized, compartmentalized shelter containing NBC detection, communications, and decontamination equipment.

Decontamination Equipment	Description
	DEKON 2000 - Decontamination disaster protection vehicle capable of operating independently. Used for personal and equipment decontamination as well as providing contamination-free drinking water. SHOWER 3000 - Capable of providing personnel showers for up to 3500 individuals in 24-hours. Associated equipment is a collapsible 5000-liter water tank. WASH 4000 - Field laundry unit. MOBILE WORKSHOP 5000 - Van with spare parts for maintenance of the complete system.
OWR DEKON Trailer 6000	Trailer-mounted decontamination device for personnel, equipment, and terrain decontamination. Integral 1000-liter water tank and portable 1000-liter water tanks. Can mix and apply decontaminant solutions.
OWR DECOFOG III Decontamination System	Portable decontamination system which dispenses decontaminant solutions in a fine mist. Normally used with GD 5 decontaminant. GD 5 has same decontamination efficiency as DS2 but not as corrosive.
OWR CLEAN 6000 G Decontamination Unit	High pressure cleaner/steam jet device.
OWR CLEAN 7000 G Decontamination Unit	High pressure cleaner/steam jet device with decontamination module.
OWR DEDAS 100 Decontamination Unit	DEDAS - Decontaminating Emulsion Direct Application System. Device used for the continuous production of decontaminate solutions and emulsions.
OWR DRESS DEKONT 8000	Mobile disinfectant and drying unit for NBC protective suits.
OWR Multipurpose Decontamination System, MPD 12 and PD 12	Used for decontamination of personnel, equipment, vehicles, aircraft, and terrain. Incorporates a shower unit, steam jet cleaner, 1400-liter aluminum water tank, and 1000-liter flexible tanks. Normally carried as a container on a vehicle but can be transported by helicopter.
INDECON Integrated Decontamination System	An integrated, containerized decontamination system. Used for decontamination of vehicles, equipment, personnel, and structures.
NBC Decontamination Truck	Standard NBC decontamination truck. Used for terrain and equipment decon. Comprised of a pump, heater, and decontaminant mixer units as well as two 1500-liter water tanks. Similar to US M12A1 PDDA.
Miscellaneous	**Description**
Marking Set, Contamination, Nuclear, Biological, Chemical (NBC)	Used by the US Army. Same as US NBC Marking Set.
Helsa-Werke casualty bags	CB protective bag for casualties with integral air blower and filter canisters.
Karcher Mediclean units	Device designed to pre-clean wounds or areas of body contaminated with NBC agents.
Atropine Aerosol Spray (AAS)	Alternative to atropine injection. Allows user to administer via nose or mouth.

340

ITALY

Decontamination Equipment	Description
Cristanini SANIJET C 921 Decontamination System	Also used by French, Spanish, US, and Korea. Self-contained decontamination device powered by air-cooled diesel engine. Similar to US M17 LDS.
Cristanini SANIJET 3000/3 Containerized Decontamination System	Compartmentalized container designed to provide personnel and garment decontamination within the structure and vehicle decontamination outside via external hose reels.
Cristanini Trailer C 90-120/2 MIL Decontamination System	Used by some NATO forces. Trailer-mounted decontamination system for vehicle, equipment, personnel and terrain decontamination.
Cristanini Decontamination and Shower Tent	Tubular frame, PVC, fabric decontamination tent.
Cristanini SANIJET Gun	Specialized gun assembly that allows descaling, decontaminant application, and rinsing to be accomplished from a single hose.
Cristanini BX 24 SPECIAL Decontamination Product	Decontaminant packaged in cartridges for use with the SANIJET Gun.
Tirrena Small Decontamination Set, SDS T 155	Small fire extinguisher-type device used to dispense DS2 decontaminant. Similar to US M11.

UNITED KINGDOM

Individual Protection Equipment	Description
NBC Poncho	CP protective poncho with charcoal kilt and integral hood.
Defender CB Mark 1 Civilian Suit	Civilian Chemical Protective (CP) suit available in five sizes. Designed to be worn over clothing and footwear. Configured as a one-piece coverall with integral hood.
Bondina Civilian NBC Protective Suit	Civilian version of British NBC suit. Supplied as a two-piece ensemble comprised of hood, smock, and trousers or one-piece coverall.
Wescare Lightweight NBC Survival Suit, Model No 100	Lightweight three-piece CP suit with integral respirator.
Wescare Lightweight NBC Survival Suit, Model No 101	Lightweight two-piece CP suit without integral respirator.
Complete NBC Kit, Civilian, Lightweight	Civilian lightweight CP kit consisting of garments and equipment in a suitcase. Comprised of oversuit, inner two-piece protective garment, full-face respirator with filter canister, industrial rubber boots, inner cotton and outer rubber garments, mask demisting pack, decontamination powder, and an instruction handbook.
Complete NBC Kit, Civilian, Heavy Duty	Civilian Heavy Duty CP kit consisting of garments and equipment in a suitcase. Comprised of oversuit, inner two piece protective garment, full-face respirator with filter canister, industrial rubber boots, inner cotton and outer rubber garments, mask demisting pack, decontamination powder, and an instruction handbook.
Heavy Duty Outer Suit	One-piece heavyweight chemical resistant and flame retardant oversuit designed primarily for civilian use.

Collective Protection Equipment	Description
NBC Liners Models GP120/GP240	Chemical resistant tent liners constructed of butyl coated nylon fabric. Portable NBC filtration unit provides pressurized filtered air.
Detection Equipment	**Description**
Chemical Agent Monitor (CAM)	Same as US CAM.
GID-2 Fixed Chemical Agent Detection System	Some NATO navies. Fixed detection system for vehicles, ships and buildings. Capable of detecting nerve and blister simultaneously.
GID-3 Graseby Ionics Detector	Designed to detect nerve and blister agents as well as monitor the effectiveness of vehicle collective protection systems. Detectors can be networked to form a perimeter defense.
Nerve Agent Immobilized Alarm and Detector (NAIAD)	Used by Portugal and Spain. Automatic alarm system comprised of a detector and alarm unit. Responds to nerve and blood agents. Similar to US M8A1.
Detector Kit Chemical Agent Residual Vapor No 1, Mark 1	Squad level detection kit for nerve and blister agents. Similar to US M256A1.
Decontamination Equipment	**Description**
Decontamination Kit, Personal No 1, Mark 1	Personal decontamination kit comprised of pads containing Fullers earth. Similar to US M13 individual decontamination kit.
Decontamination Kit, Personal No 2, Mark 1	Personal decontamination kit consisting of a 113-gram dispenser of Fullers earth.
Decontamination, NBC, Apparatus, Portable, No 2 (DAP 2)	Designed for decontamination of vehicles and equipment. Consists of pump, hoses, and brushing wand. Similar to US M13 DAP.
Decontaminant Chemical Agent XL1E1	Issued in a kit that contains specific reagents for persistent chemical agents.
WDL Dual-Purpose Decontamination and Large Area Screening System	Dual-purpose decontaminant application and smoke screening system. Capable of dispensing hot air and water as well as mixing decontaminates.
Portaflex 300 Decontamination Shower Unit	Designed for personnel decontamination.
Miscellaneous	**Description**
Pearson Pathfinder Marking Device	In service with the British Army. Automatically marks boundaries of areas such as minefields, and NBC contaminated terrain. Can be attached to any vehicle. Fires aluminum rods via compressed air.
Chemical Agent Resistant Material (CARM)	A two-layer chemically resistant polyethylene material used to protect personnel, supplies, and equipment from liquid agent contamination.

346

Other Treaties/Alliances or Neutralities

ISRAEL

Individual Protection Equipment	Description
NBC Mask No 10A1 (Children 8-12 years)	Protective mask for children. Has drinking system and voicemitter.
NBC Mask No 30 (General Use)	General use protective mask with voicemitter.
NBC Mask No 33 (General Use)	General use protective mask with drinking system, voicemitter and right-handed canister option.
Civil Defense Hood	Hood with transparent face panel and battery-powered forced ventilation system.
NBC Disposable Protective Clothing	Clear disposable three-layer transparent protective clothing. Consists of trousers and jacket with hood.
SUPERGUM NBC Protective Clothing	Emergency protective clothing for military and civilian applications. Available in sizes for adults and children. Comprised of jacket, trousers, gloves, footwear covers.
NBC Protective Garments, Lightweight, Type EC-UF-222	CP overgarment system with nylon outer shell.
NBC Protective Garments, Standard, Type EC-GF-231	CP overgarment system with cotton outer shell.
Collective Protection Equipment	**Description**
Elbit Multipoint Gas Monitor (MGM)	Continuous air quality monitoring system capable of analyzing air from up to 24 remote sampling points. Can be upgraded to incorporate meteorological and hazard assessment software.
SHALON collective NBC filtration systems	NBC filtration systems built to Israeli civil defense specifications. Each unit is comprised of a washable synthetic foam pre-filter, NBC gas particulate filter, fan unit, flowmeter, and overpressure valve. Units are available for 12, 25, 50, and 100 person shelters.
Detection Equipment	**Description**
CHASE Chemical Agents Sensor	In service with the Israeli Defense Forces. Chemical agent detection device capable of detecting G and V nerve and H series blister agents. Can be configured for either vehicle or manpack operation.
RAFAEL CHAMP Chemical Agent Detector	Hand-held detector unit capable of detecting nerve, blood, and blister agents.
CDK chemical detection kit	Simplified reliable chemical detection kit designed for use by non-specifically trained personnel. Detects nerve and blister agents displaying positive results as a color change.
Elbit Alarm and Power Remote - Control Unit (APCU) for M43A1.	Device that interfaces the M43A1 alarm with communication systems providing audible and visible alarms.
Decontamination Equipment	**Description**
DP-2 decontamination powder	Homogeneous, finely ground powder decontaminant for skin and personal equipment.

SWEDEN (Neutral)

Individual Protection Equipment	Description
New Pac Lightweight Disposable C - Cover Dress S/91	Used in Austria, Sweden, Denmark, and Finland. Lightweight CP ensemble consisting of jacket with integral hood, trousers with integral footwear covers and gloves.
New Pac Disposable C - Cover Dress S/89	Used in Sweden. Transparent, disposable full-body CP cover with footwear covers.
New Pac C - Cover Poncho, N/60	Used in Norway. CP poncho.
New Pac C - Cover Poncho, N/90	Used in Norway. CP poncho.
Combat Suit 90	Used in Sweden. CP suit consisting of jacket with integral hood, trousers and overboots. Worn in place of combat uniform.
Collective Protection Equipment	**Description**
Trellsystem chemically hardened hospital tent system.	Inflatable, chemically hardened hospital tent with overpressurization, filtration, and air conditioning.
Detection Equipment	**Description**
CW Detection Device	Small enzyme based detection device produced in two variations. One for nerve agents and one for mustard.
Decontamination Equipment	**Description**
Hot Air Unit, VA-8	Decontamination device that generates super heated air for uniform/equipment decontamination.
Cargo mobile decontamination station	Mobile decontamination station built on a trailer chassis. Comprised of an extending tent with three sections, 500-liter water tank, pump unit, heating unit and wastewater collection system. Used for personnel decontamination.

COVERS

The use of buildings and covers to protect supplies and equipment can provide significant benefits to the fixed site commander. Limiting the exposure of these items to NBC agents reduces the hazard, and subsequently the need for decontamination. As a general rule anything that provides a barrier between the items of concern and the environment will provide some degree of protection. Currently there are NBC protective covers (NBC-PC) available as Common Table of Allowance (CTA) items. These covers are specifically designed to provide a 24-hour barrier from liquid agent contamination.

Covering can also be accomplished with items as basic as canvas tarpaulins and plastic sheeting, or as elaborate as Large Area Maintenance and Tactical Aircraft Shelters. The following table depicts some examples of material and equipment that may be available to the fixed site commander for this purpose. These items generally provide protection from liquid agent hazards, however those with integral overpressure/filtration systems additionally provide vapor hazard protection. In all cases a significant degree of protection will be afforded to the personnel, equipment or material, either covered or contained within.

Note: Caution should be exercised when using commercially available protective covers/material in place of military issued covers. These items may not possess the multispectral camouflage qualities of their military counterpart and would subsequently be subject to detection by enemy acquisition systems.

ITEM	REMARKS
ROWPU Cover	Lightweight flexible fabric for covering ROWPU. Puncture, crack, and tear resistant will prevent liquid agent penetration for a minimum of 24-hours.
Large Area Shade System (LASS)	Fabric, field depot, 210 feet x 210 feet x 18 feet
Large Area Maintenance Shelter (Clamshell)	Aluminum framed PVC coated fabric shelter, 192 feet x 75 feet x 31 feet
Tactical Aircraft Shelter (TAS)	Aluminum box frame PVC coated fabric shelter with clamshell opening at each end, 100 feet x 64 feet x 27 feet. Has air conditioning and heating ductwork.
Tent Extendable Modular Personnel (TEMPER)	Modular aluminum framed fabric tentage system, (8 feet x 20 feet x 10 feet.
Modular Command Post System (MCPS)	Aluminum framed PVC coated fabric tent, 11 feet x 11 feet x 9' feet. (Effort is underway to develop a chemically hardened version as part of a pre-planned product improvement (P^3I)).
Modular General Purpose Tent System	Replacement for current General Purpose Tents; Pole or frame support system fabric tent. Extendable to any length required by adding modules, 54 feet x 18 feet x 14 inches.
Chemically and Biologically Protective Shelter (CBPS)	Protective shelter system constructed of flouro-polymer/aramid laminate fabric that provides liquid and vapor protection and is readily decontaminable. Integrated with a Field Litter Ambulance (FLA), M1097 HMMWV, 300 square feet fully integrated. Also contains a 10 kW tactical quient generator on a high mobility trailer.
Modular Chemically Hardened Tent	Multipurpose frame supported collective protection tent. Tent fabric is flouropolymer/aramid laminate. Features four interchangeable removable walls. Individual tent covers 121 square feet.

GOVERNMENT/NON-GOVERNMENT ORGANIZATION ASSETS

Agencies or organizations that may or may not be government affiliated may be capable of providing assets to the fixed site commander in either materials or assistance. Examples of these agencies or organizations includes but is not limited to:

United Nations Peacekeeping Forces
Source of trained personnel, equipment, and materials

- World Health Organization
  Source of medical assistance teams
- International Red Cross/Red Crescent Societies
  Source of materials, manpower, and equipment.

HOST NATION ASSETS

In addition to the resources available through military supply channels, assets may be available from the host nation. Use of these facilities will not only reduce turn around time, but will also alleviate some of the burden placed on military logistics channels. Examples of these include, but are not limited to:

- Local Police Departments
  Source of trained personnel for refugee handling, maintenance of civil order, security operations, traffic control
- Local Retail Centers
  Source of covers, expendable supplies, decontaminants
- Local Fire Departments
  Source of high-pressure water dispensing equipment, hoses.

Note: In some countries local fire departments are outfitted with equipment packages to support evacuation of the public from toxic areas. (e.g., French Fire Brigades)

- Local Water Department
  Source of large quantities of water
- Local Sanitation Department
  Source of trained personnel to handle disposal of non-persistent materials and hazardous waste
- Environmental Control Office or similar agency
  Source of trained personnel to assist in monitoring, reduction, and disposal of hazardous material and waste
- Civil Defense Agencies
  Source of trained personnel, detection equipment, and materials
- Water Treatment Plants
  Source of decontaminants
- Local Construction Companies
  Source of earth moving equipment, materiel-handling equipment, construction materials
- Multi-National Corporations
  Potential source of many assets

APPENDIX C
VULNERABILITY ANALYSIS AND MITIGATION

OVERVIEW

Vulnerability analysis is the continuous, systematic estimating of friendly consequences from threat NBC attacks. The overall methodology includes IPB, risk assessment, and vulnerability analysis with associated mitigation measures. This appendix provides a "how to" approach for risk assessment and a discussion on vulnerability analysis that allows the commander to determine his/her units vulnerability and how to reduce that vulnerability.

RISK ASSESSMENT

The charts (figures C-1 to C-3) on the following pages describe the risk assessment process designed to aid the commander and staff in determining force risk levels and the minimum recommended steps to reduce the NBC risk. Follow these basic steps when using the risk assessment charts:

- Enter the chart at "Start Here".
- Answer the main question in the shaded box by considering subordinate questions/answers underneath it.
- If the answer to any question below the shaded box is a "yes," then the shaded box answer is "yes."
- Go to the next lower box and repeat the process.
- If the answer to a shaded box question is "no," read the risk assessment to the right.
- Read to the right to determine the minimum recommended procedures to reduce risk.
- Complete the assessment by writing the assessed risk level in the risk assessment box at the bottom of the page.

Commanders and staffs should modify these charts as they identify additional questions and mitigation measures based on mission specific situations.

28

NUCLEAR RISK ASSESSMENT

Select YES if one or more boxes are checked

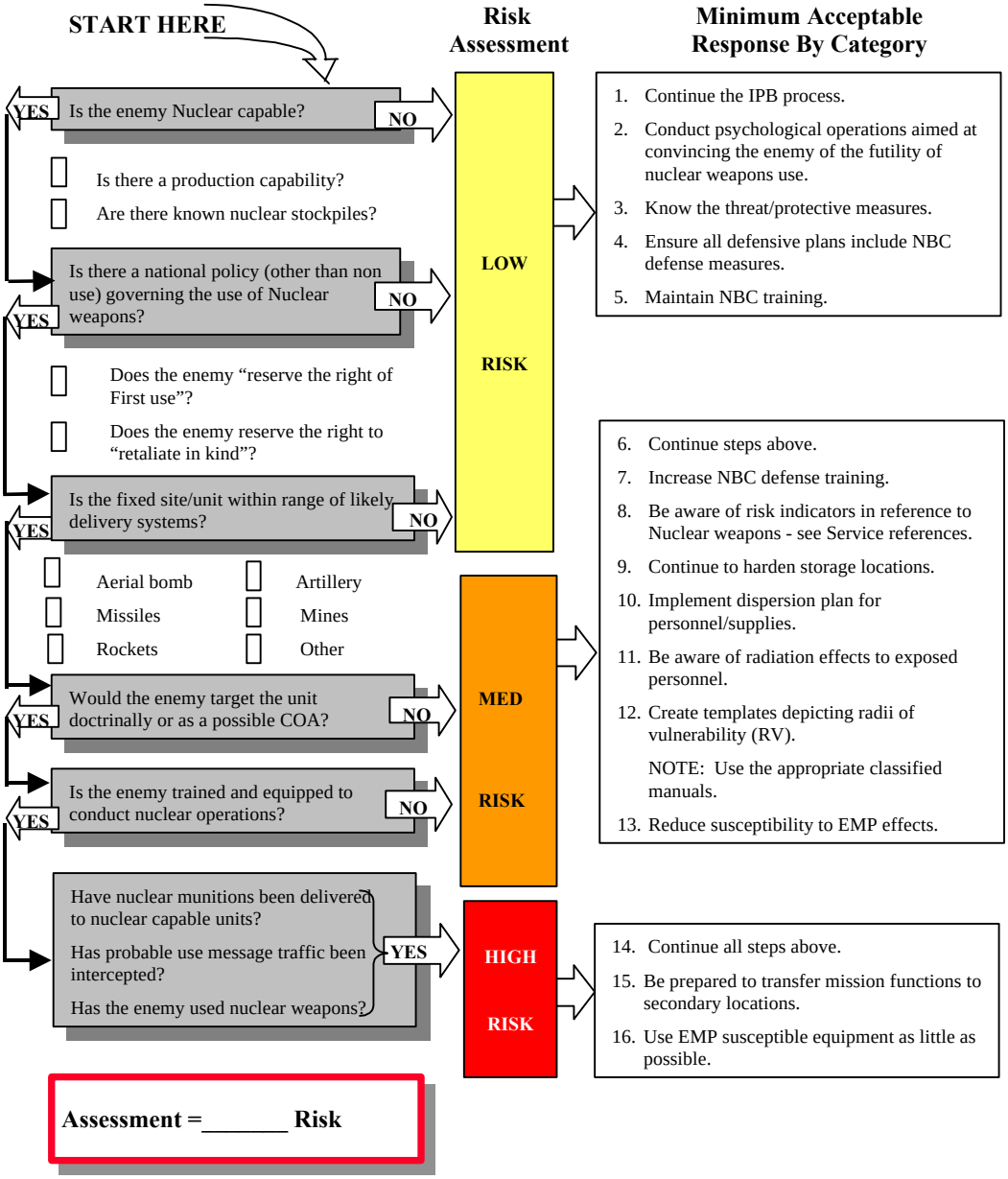


Figure C-1. Nuclear Risk Assessment

29

BW RISK ASSESSMENT

Select YES if one or more boxes are checked

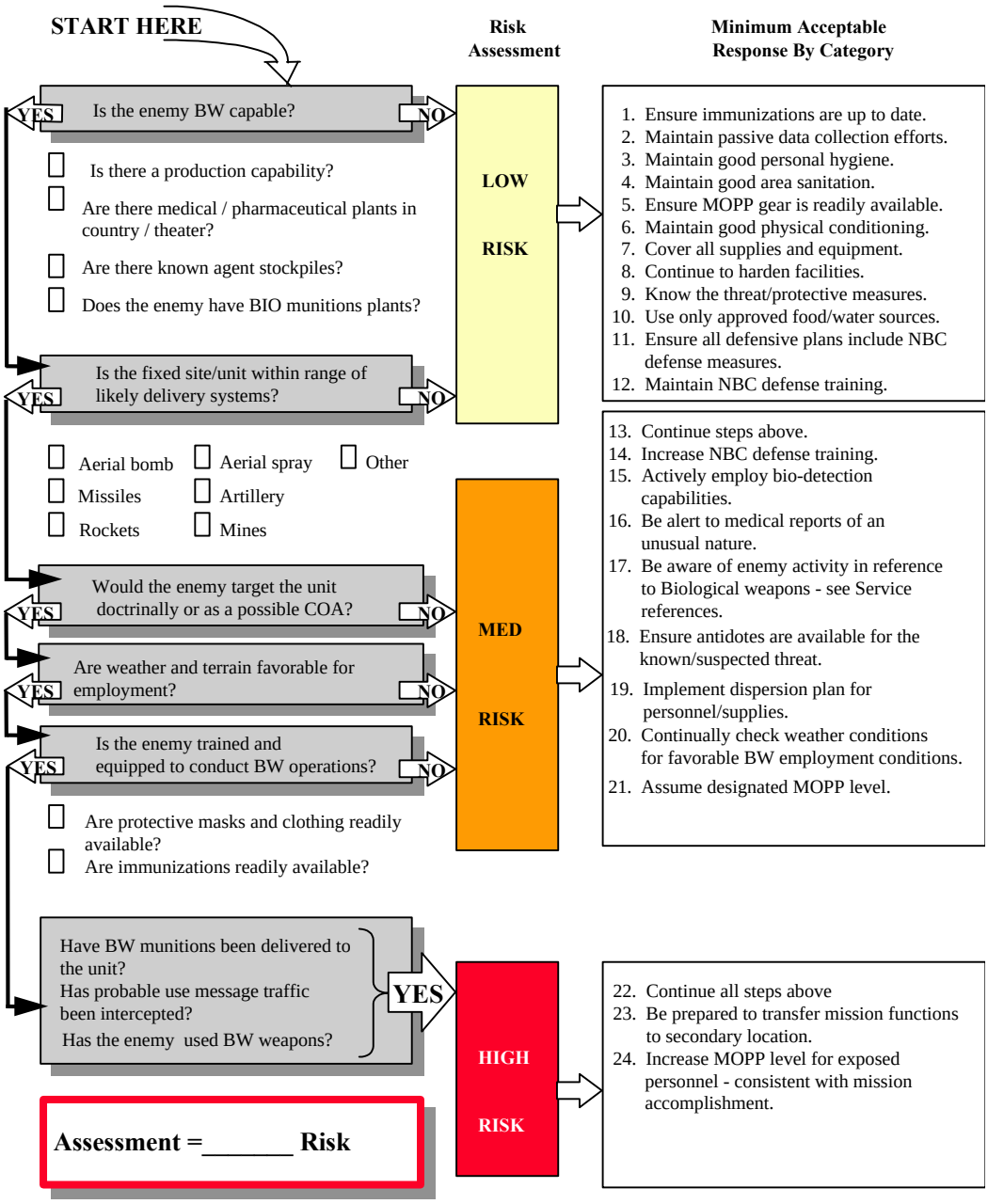
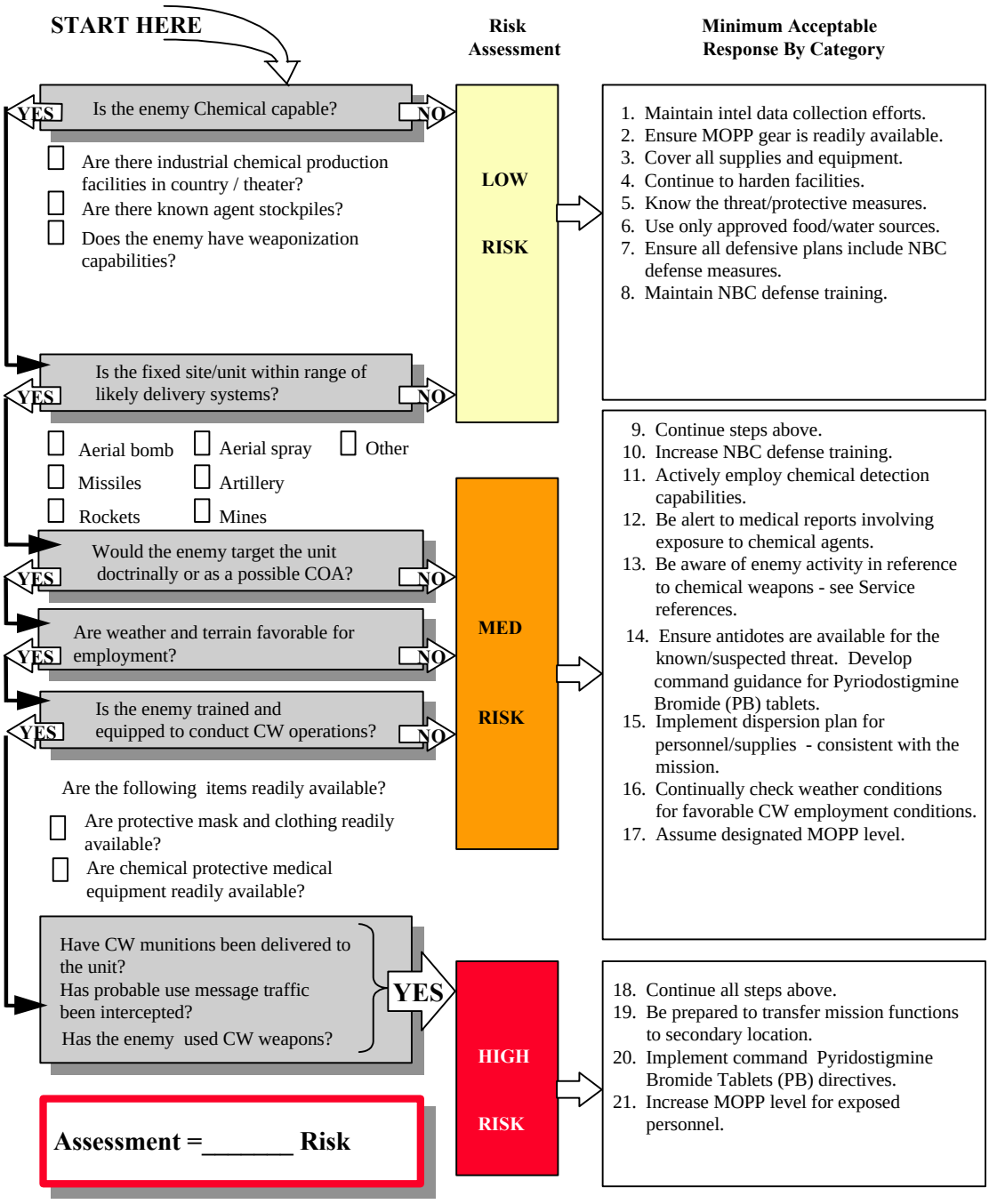


Figure C-2. Biological Risk Assessment

30

CHEMICAL RISK ASSESSMENT

Select YES if one or more boxes are checked



31 **Figure C-3. Chemical Risk Assessment**

NUCLEAR VULNERABILITY

To assess a unit's vulnerability to nuclear attack, the commander determines the unit's NBC defense protection level and the type and size of weapon likely to be employed by the enemy. The commander then weighs various courses of action (COA) to determine which COA allows for mission accomplishment at an acceptable risk.

When addressing unit vulnerability to nuclear weapons employment, consider; blast or shock wave, thermal radiation or heat, initial or prompt radiation, and residual radiation (fallout), and EMP effects. The potential exists for an enemy to employ a weapon which produces only one of these effects; e.g., radioactive dust particles, EMP. Therefore, assess vulnerability to each effect, not just the greatest effect.

A nuclear explosion's biological effects are measured according to the amount of radiation (centigrays) to which personnel are exposed. For the biological effects of radiation in man refer to Table A-2, FM 3-3-1/FMFM 11-18, *Nuclear Contamination Avoidance* or appropriate Service publication.

Two techniques to evaluate unit vulnerability to nuclear detonations are:

- A technical approach in which unit dispositions are compared with the effects of an expected yield, and
- An operational approach in which unit dispositions are compared with targeting criteria used by the threat target analyst.

In a nuclear environment, the more concentrated a unit is, the more lucrative a target it becomes. If the unit itself is not the target, but falls within the fallout pattern, unit monitors will be capable of providing the commander with essential information regarding the hazard. Nuclear hazard prediction is addressed in FM 3-3-1/FMFM 11-1*8, Nuclear Contamination Avoidance* or appropriate Service publication.

The primary tool for analyzing friendly dispositions is the radius of vulnerability (RV). RV is the radius of a circle within which friendly troops will be exposed to a risk equal to, or greater than, the emergency risk criterion (5 percent combat ineffectiveness) and/or within which material will be subjected to a 5 percent probability of the specified degree of damage (see the RV tables in JP 3-12.2 (SRD), *Nuclear Weapons Employment and Effects Data*, or JP 3-12.3, *Nuclear Weapons Employment and Effects Data (Notional) (unclassified for training purposes).* The ground zero (GZ) for the RV is always assumed to be the point where detonation will do the greatest damage to the unit or installation. Delivery errors are not considered. For RV of unspecified categories, see comparable table chart in JP 3-12.2 or JP 3-12.3.

Based on vulnerability radii and unit size, commanders may determine risk from a nuclear attack and whether or not to adjust unit dispersion. However, personnel may not be the targets. Often equipment, due to sensitivity and vulnerability, becomes the target. See FM 3-3-1/FMFM 11-18, *Nuclear Contamination Avoidance* for training data. For actual vulnerability radii refer to JP 3-12.2 (SRD).

Analyzing the vulnerability of friendly dispositions and installations consists of:

- Determining, the appropriate threat yields based on current intelligence. Determining the disposition of unit personnel.
- Obtaining the appropriate vulnerability radii from the RV table (JP 3-12.2 (SRD) or JP 3-12.3 or FM 3-3-1 for training purposes).
- Estimating fractional coverage for each target category, using the visual, numerical, or index technique. For information concerning these techniques reference JP 3-12.2 (SRD) (visual technique is discussed in FM 3-3-1/FMFM 11-18 for training purposes).

- Recommending ways to decrease vulnerability and increase protection.

To determine vulnerability using the visual technique, outline the unit battle position. Use a compass, a piece of plastic with the RV drawn to scale on it, or a circular map scale. Superimpose the RV chosen from Table C-1 or JP 3-12.2 over the predicted targeted area.

The GZ used for the analysis is the location that would result in the highest fractional coverage of the target. From this worst case GZ and the appropriate RV, an estimation of the percentage of casualties or materiel damage that might result from an enemy nuclear strike may be determined.

Using the center point of the compass, template, or circular map scale as the GZ, choose the GZ that would result in the highest fractional coverage of the target area. Visually estimate the percentage of the unit covered by the RV.

If this fractional coverage yields unacceptable losses of personnel or equipment, the commander must then make a decision of how best to reduce the casualty and equipment loss rate. This may be done by adding shielding or enacting vulnerability reduction measures. If a mechanized battalion occupies a battle position 5 km wide and 2.5 km deep, it could be positioned as in Figure C-4. Target elements are uniformly dispersed in the area. In this example, the RV from a 5-kiloton weapon for personnel in armored personnel carriers is 1250 meters (as determined from Table C-1). Worst case the RV by placing the GZ where it provides the largest target coverage. Fifty percent of the battalion is covered by the RV, thus up to 50 percent of the battalion's personnel in armored personnel carriers could become casualties. When the same battalion deploys in three company battle positions in depth, the distances between positions significantly reduce the damage probability, even assuming the weapon detonates at the worst case GZ. As seen in Figure C-5, although one company is 100 percent vulnerable, the battalion overall is only 33 percent vulnerable.

Table C-1. Radii of Vulnerability (RV) (meters)

Cat	Personnel In- (Latent ineffectiveness, based on governing effect)					Moderate Damage				Severe Damage		
						Wheeled Vehicles		Tank	Towed Arty	Supply Depot	Randomly Parked Helicopters	
Yield (kt)	Open	Open Fighting Position	APC	Tank	Earth Shelter	Exp	Shld				Cgo Trans	Light Observation
0.1	700	600	600	500	300	200	150	100	100	100	400	500
0.5	900	800	800	700	450	300	250	200	200	200	500	800
1	1200	900	900	800	500	400	350	300	250	250	700	1100
2	1700	1000	1100	900	600	500	450	400	300	300	850	1300
3	2000	1100	1200	1000	700	600	500	500	400	450	1000	1600
5	2500	1200	1250	1100	800	700	600	600	500	500	1200	1900
10	3200	1300	1300	1250	900	800	700	700	600	600	1500	2500
15	3700	1400	1400	1300	950	900	800	800	700	700	1800	2800
20	4000	1500	1450	1400	1000	1000	900	900	800	800	1900	3400
30	5000	1600	1500	1500	1100	1200	1100	1000	900	950	2200	3700
40	5500	1700	1600	1600	1200	1400	1250	1100	1000	1200	2500	4100
50	6000	1800	1700	1700	1300	1700	1500	1200	1200	1400	2700	4500
100	8000	1900	1800	1800	1400	2200	1900	1300	1300	1700	3200	5700
200	12000	2000	1900	1900	1500	2500	2000	1500	1500	1900	3700	6200
300	14000	2100	1950	1950	1600	3000	2100	1600	1600	2000	3800	7100

Notes:
To obtain RV, enter yield column at the nearest listed yield.
Unclassified, For Planning Purposes Only.

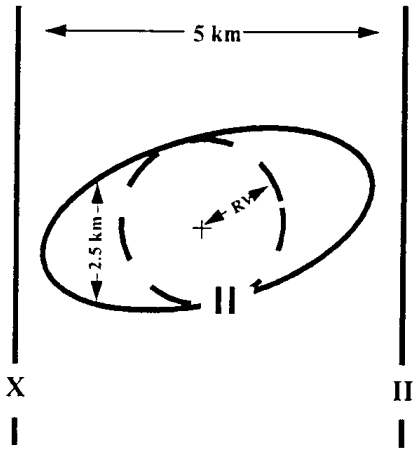


Figure C-4. Single Position

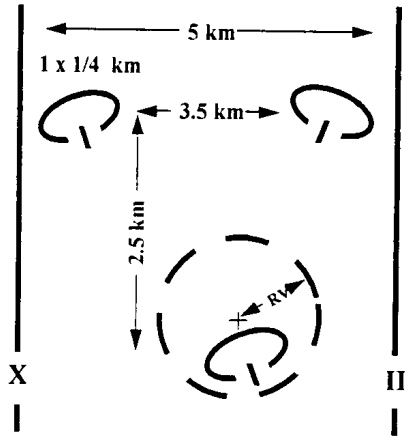


Figure C-5. Multiple Positions

BIOLOGICAL VULNERABILITY

Prior to conducting vulnerability analysis, determine the risk of a biological agent attack or the enemy's capability and probability of use (see page C-3). Once it is determined that the enemy has the capability and the willingness to employ biological weapons; the next step is to determine the unit's vulnerability to an attack (table C-2).

Note: Remember, even if an enemy has no capability to employ biological weapons, the unit is still vulnerable to endemic diseases.

To determine vulnerability to biological agents:

- Determine immunization levels in relationship to threat/theater endemic agents and availability of prophylaxis.
- Determine unit's protective posture.
- Determine unit's biological detection posture - do you have BIDS, Interim Biological Agent Detection System (IBADS), LRBSDS, or Joint Point Biological Detection System (JPBDS).
- Determine unit's hygienic practices. For example, are troops provided means to bathe/cleanse regularly?
- Determine current or projected maneuver (or mobility) disposition.

Vulnerability ratings are subjective. Apply rating measures in relationship to probable agent of choice. Also, ratings do not consider troop motivation/morale factors. The final rating provides a general vulnerability analysis and should be used as a basis for a thought-process leading to sound recommendations on vulnerability reduction measures.

Table C-2. Biological Vulnerability Matrix

IMMUNIZATION (AGAINST PREDICTED AGENTS)	RELATIVE VALUE	PROTECTIVE POSTURE	RELATIVE VALUE	DETECTION POSTURE	RELATIVE VALUE	HYGIENE	RELATIVE VALUE	DISPOSITION	RELATIVE VALUE
COMPLETE ≥ 90%	2	MOPP3/4	2	BIDS LRBSDS JPBDS	2	GOOD	1	MOBILE	1
INCOMPLETE < 90%	4	*MOPP1/2 MASK ONLY	4	LESS THAN TWO OF THESE SYSTEMS	4	AVG	2	SEMI-MOBILE	2
NONE	6	MOPP READY/MOPP ZERO	6	NONE	6	POOR	3	STATIC	3

RELATIVE VALUES = SUBJECTIVE RATING	
8 - 9	LOW
10 - 16	MEDIUM
17 - 24	HIGH

Minimum actions resulting from these ratings are described below.

LOW: Maintain current efforts. Attempt to improve on those areas that are weak.

MEDIUM: Analyze current actions and increase efforts to reduce rating - concentrate on those areas that you have immediate control over (e.g., MOPP levels & hygiene and possibly detection assets).

HIGH: Analyze current actions and immediately increase efforts to reduce rating - concentrate on those areas that you have immediate control over (e.g., MOPP levels and hygiene).
If you don t have operational control of detection assets, determine where these assets are and if you are inside the detection umbrella or if these assets can be repositioned to cover your operation. Determine if immunization rates are satisfactory for the total force. Typically contract workers, from whatever source will require more immunizations than US military personnel. Provide immunizations as soon as medical and political situations allow. Remember that immunizations require time to work effectively.

* If mask only protective posture provides required protection for predicted agent, use a value of 2.

EXAMPLE BIOLOGICAL VULNERABILITY ANALYSIS

1. Begin at the left column and add the relative values from each column.

- Approximately 30% of unit has been immunized.
- Unit is currently in MOPP ZERO.
- Unit has a BIDS attached.
- Unit practices good hygienic measures.
- Unit is in a static fixed site.

2. Adding the values shows a -

4 for Immunizations
6 for MOPP level
4 for Detection posture
1 for Hygiene
3 for Disposition
TOTAL = 18 = High Vulnerability

NOTE:
Read the vulnerability rating at the bottom of the chart to determine minimum steps to take to reduce rating.

This analysis provides a basis to advise on vulnerability (and the reasoning used), and more importantly, provide vulnerability reduction measures at the same time.

CHEMICAL VULNERABILITY

Prior to conducting a vulnerability analysis, first determine the risk of a chemical attack or the threat's capability and probability of use (see figure C-3).

If the possibility exists for the threat to employ chemical agents, conduct a vulnerability analysis in two parts:

- **First**, make an estimate of the threat's capability to employ chemical munitions in the unit's AO/AI (see page C-4, Chemical Risk Assessment) within a specific time period.
- **Second**, use this information to generate simplified effects information.

ESTIMATE DELIVERY CAPABILITY

Step 1. **Determine time periods of interest**. Time periods of interest are determined based on the commander's operational concept and situation variables, such as mission, enemy, terrain, troops, time, and civilian consideration or METT-TC. The time period is determined in coordination with the intel and operations officers. They will normally conform to phases or the expected duration of an operation; however, it may be desirable to use other criteria.

For example: A maintenance unit may want to use the expected time lag between an anticipated threat chemical attack and the time required to retrieve and don their protective gear (as in "MOPP READY" protective posture) as the time period of interest. A time period may also be based on factors relating to enemy tactics, such as the expected arrival time of a second echelon force. Further, significant weather changes could also influence the selection of time periods. The time period of interest can range from six- hours to 48-hours.

Vulnerability analysis is generally conducted in support of the planning process, **not** in support of current operations. While some planning factors are based on a 12-hour to 48-hour cycle. Fixed site operations may be based on a significantly higher time frame (i.e., 12-hours to 96 hours), with time periods of 24-hours or greater used when IPB allows. Time periods of less than six- hours are generally not used. For short-term actions, shorter time periods could be used to estimate the effects of initial enemy preparation fires or to estimate the effect of a single chemical agent attack.

Step 2. **Associate weather data with each time period.**

Associate each time period with a temperature, wind speed, and stability category. The temperature will impact primarily on agent persistency. For each time period, temperature should be expressed as one of the following (in degrees Celsius): 55^{o}, 50^{o}, 40^{o}, 30^{o}, 20^{o}, 10^{o}, 0^{o}, -10^{o}, -20^{o}, or -30^{o}.

NOTE: All required information can be obtained from the Chemical Downwind Message (CDM).

Determine temperature by taking the average of the temperatures from each CDM line applicable to the time period of interest. Use this average temperature for all calculations.

NOTE: When estimating persistency for agents expected to last beyond the time period of interest, use the average daily temperature of the day in which the attack may occur.

Wind speed will impact on casualty production, persistency, and downwind agent travel. It should be expressed as one of the following: 3, 6, 9, 12, 15, or 18 kmph.

NOTE: As a rule of thumb, for any wind speed above 18 kmph, use 18 kmph. Calculate wind speed in the same manner used above for temperature. In some situations it may be necessary to modify this number for casualty estimate purposes.

For example: If a 24-hour period contains six-hours of expected high wind speeds (unstable conditions), you will probably elect to disregard those figures and develop a separate (lower) average for casualty estimation. The staff estimates an enemy would not employ chemicals for casualty effects during that six-hour period of high winds. Base this decision on the magnitude and duration of the wind change and the expected enemy COA.

Stability categories (stable, neutral, or unstable) also affect casualty production and downwind agent travel. However, their impact is minor compared to temperature and wind speed. Determine the stability category in the same way as temperature and wind speed.

Other environmental factors exist that could impact the analysis.

For example: Terrain and vegetation could affect the estimate. However, these factors have been incorporated in the persistency estimate process.

Step 3. **Estimate delivery capability.**

Estimate the number of chemical munitions likely to be employed in your AO for each required time period. Coordinate with the intelligence officer and/or fire support officer (FSO), if available, to produce this estimate.

- Provide the intel officer with the time periods of interest.
- The intel officer can produce information concerning the threat's capability to deliver chemical munitions in your AO.

The estimate should indicate the number of delivery units, by type, and the number of rounds, by agent, if available. The intel officer also provides estimates on when, where, and what type of agent the enemy will use in the AO. If the situation or event template does not yield needed information, assume the enemy can optimize the agent mix.

For example: To determine the threat's capability to create a contamination obstacle, assume they will fire only persistent agents. Likewise, to predict casualty effects, assume the enemy will fire agents that have the greatest casualty producing effects.

When the primary threat is covert or unconventional, express enemy delivery capability in terms of agent weight or as agent weight times some expected delivery means.

For example: Ten kilograms of nerve agent delivered by an agricultural sprayer. If estimates indicate limited agent supply, it will be difficult to estimate how much of that supply will be used each day. As an option for this situation, conduct the analysis for a single enemy attack based on the threat's maximum employment capability during the selected time period.

The intelligence officer considers a number of factors in making his estimate:

- Number of employment assets within range of the AO
- Other AO the enemy force must service. (NOTE: Do not assume every delivery system within range will be firing into the AO being considered.)
- Enemy locations of chemical munitions
- Weather effects on probable agents
- Threat forces' capability to deliver chemical munitions to delivery systems
- Impact of threat attacks on civilians

The intelligence estimate should provide a range of numbers based on estimated COA for each time period. The estimate should provide the enemy's maximum capability and his likely delivery capability. Alternatively, different estimates can be provided that would support various enemy

COA. Estimates should not be based on friendly COA unless they would significantly impact on enemy delivery capability.

It is not necessary to assess every possible situation and enemy option. To do so would result in inefficient use of available time. The goal is to provide estimates to the commander/staff, which can be later refined. Continuously assess the situation and look for events and options with the potential of changing the outcome of the battle.

GENERATE EFFECTS INFORMATION

At this point you have estimated time periods and munitions estimate combinations. For each of these combinations, develop a set of effects information: casualty estimates, contamination obstacles, persistence, and times and locations of downwind agent effects. Effect information will provide the following estimates:

- Casualty effects.
- Downwind agent effects.

Determine Casualty Estimate

Step 1. **Determine probable friendly targeted size.**

- Based on the chemical staff's and S2/G2 IPB, select an area/activity the enemy would probably target then determine the target size. For example, determine the area occupied by a fixed site activity, in this case 400m x 600m.

Calculate the number of hectares (ha) in the selected target area. **For Example:** One hectare is 10,000 square meters; therefore, an area that is 400m x 600m = 240,000 square meters or 24 hectares.

Step 2. **Determine probable agent.** Unless it is known which agents the threat will employ, assume the most effective casualty-producing agent available.

Step 3. **Estimate casualties.**

Estimate casualties based on:

- IPB
- The number of rounds the threat may use to engage the specific target
- Predicted temperatures (from CDM or other sources)
- Then refer to tables C-4, C-5, and C-6 for corresponding casualty percentages.

Note: For Tables C-4, C-5, and C-6, if the number of rounds falls between given numbers assume worst case by rounding up to the next higher number.

Casualty estimates. The casualty estimates are valid for wind speeds less than 20 kmph. Other factors such as air stability category, humidity, variations in wind speeds under 20 kmph, and delivery errors were found to have minimal effect on casualty estimates for a given time period as opposed to a specific point in time.

For example: The templated target area is 24 hectares, predicted agent is GB, the temperature is 10^{o} C (degrees Celsius), and the weapon is 152mm gun/howitzer. Intelligence analysis estimates the enemy will fire 240 rounds at the target. 240 rounds divided by 24 hectares is 10 rounds per hectare. Go to Table C-4 and extract approximate casualty percentage (50%). To determine blister agent casualties, use the same procedures and table C-6; however, use MOPP level rather than temperature.

Table C-4. Sarin (GB) Casualties.

Munitions in Rounds per Hectare ($100m^2$)			Temperature (degrees Celsius)			
MLRS	150-155mm	120-122mm	-12°C	0°C	10°C	20°C
			Casualty Percentage			
1	2	4	10	16	24	33
2	4	7	14	22	30	40
3	6	10	19	27	37	47
4	8	14	25	34	45	54
4	10	17	31	40	50	60
Based on 15 liter/minute breathing rate (rest or light work) and 9 second masking time.						

Table C-5. Thickened Soman (TGD) or VX Casualties.

Munitions in Rounds				Temperature (degrees Celsius)			
Missiles per 1000 ha	Missiles per 150 ha	Bombs per 1000 ha	Bombs per 150 ha	-12°C	0°C	10°C	20°C
				Casualty Percentage			
6	1	26	4	5	14	20	21
9	2	40	6	8	18	25	25
12	2	54	8	12	24	31	31
15	2	68	10	16	28	36	36
18	3	80	12	19	32	40	41
21	3	94	14	21	35	42	43
24	3	106	16	23	37	44	45
Based on MOPP ZERO. At higher levels, agents are not as effective due to the increased skin protection.							

Table C-6. Blister Agent Casualties.

Munitions in Rounds per Hectare ($100m^2$)		Protective Posture	
		MOPP ZER0	MOPP1
150-155mm	120-122mm	Casualty Percentage	
4	7	17	13
7	14	24	18
11	20	34	23
14	27	43	28
18	33	51	32
21	40	57	36

Determine Downwind Hazard Risks

Associated risks from downwind hazards (see ATP-45 (A)/FM 3-3/FMFM 11-17 or appropriate Service publication for downwind prediction models) can be broken into three categories:

High casualty risk. Occurs at winds speeds of 10 kmph or less during slightly stable, stable, or extremely stable atmospheric conditions. Agent clouds will produce very narrow and very long hazard clouds. Dosages of 100 times the lethal levels are possible in the hazard area.

High degradation risk. Occurs during stability categories of neutral to very unstable and wind speeds less than 10 kmph. Agent clouds will produce wide hazard areas with lethal effects rarely extending as far as 10 kilometers. The casualty risk to warned, unmasked personnel is low. However, due to the large cloud width it is possible for every unit in the downwind hazard area to be forced to mask for several hours.

Low casualty risk. Occurs at wind speeds of 10 kmph or greater at stability categories of neutral to very unstable. The casualty risk is very low outside the area of immediate effects. Although a significant number of units will be forced to mask, agent duration will be short and will not extend as far as in previous categories.

APPENDIX D
FIXED SITE NBC DEFENSE PLANNING TOOLS

OVERVIEW

This appendix supports the discussion in Chapter 3 by further focusing NBC defense considerations on fixed site operations. The format used is the standard OPORD format with a brief statement as to the type information which might be addressed under that portion of the site OPORD. Because of the multiple tenant activities normally found on a base or within a base cluster, it is important that all tenants operate in concert and respond to NBC situations in a like manner. Organizing the entire base NBC defense under one plan will help preclude some tenants being protected and others "not getting the word."

The following sections, Mission Template (Section I); NBC Annex (Section II); NBC Recon/Surveillance/Monitoring Appendix (Section III); and Smoke Support Appendix (Section IV) are designed to stimulate thought as to the type information to be included. The sections are not intended to exclude the application of specific mission considerations not addressed in this text.

KEY POINTS FOR ISSUING ORDERS

This section provides several general rules for preparing and issuing good orders.

PREPARATION

- **Clarity.** Clearly convey your NBC defense message through NBC doctrine, use of approved acronyms and abbreviations, and use of established military terminology.
- **Completeness.** Include all the information and instructions necessary to coordinate and execute NBC defense operations. If more information is forthcoming, state expected time/content. Do not leave open ends.
- **Brevity.** Avoid providing unnecessary NBC defense details; however, do not sacrifice clear and complete orders for brevity.
- **Use the affirmative.** Direct expressions serve to convey simple, clear meanings to instructions.
- **Avoid qualifying directives.** Meaningless expressions and adverbs do not clearly fix responsibility for actions.
- **Authoritative expressions.** Be direct, decisive, and clear in fixing mission needs, support, and responsibility.
- **Timelines.** Do your planning early and continuously; permit maximum incorporation of NBC defense into all phases of planning and implementation.

ISSUING ORDERS

- Give simple and direct NBC defense missions.
- Give the units time to plan and prepare for mission execution.
- Use the one-third/two-third rule; backwards plan to allow subordinates two-thirds of the total time available.
- Obtain a backbrief to ensure comprehension.

SECTION I.
MISSION TEMPLATES

Mission templates provide a "road map" for planning, preparing, and successfully executing operations. The NBC defense staff uses doctrinal templates (see figures D-1 to D-5) to plan NBC defense operations, to employ NBC reconnaissance, biological detection, smoke and

decontamination assets, and to conduct battle management. This section provides tools for developing OPORDS and employing chemical assets.
Each template provides the process for planning, preparing, and executing the chemical support mission from the staff's perspective. The boxes on the template serve as memory aids and some tasks are self-explanatory.

The staff templates chemical missions that support these operating systems:

- Reconnaissance, Surveillance and Intelligence: NBC reconnaissance and biological detection support CCIR collection efforts.
- Mobility and Survivability: Avoidance, protection, and decontamination measures directly support mobility and survivability efforts along with friendly smoke/CCD operations.
- Command and Control: Tracking and controlling the disposition of NBC defense assets provides options for flexible NBC defense execution.
- Combat Service Support (CSS): Providing force protection, sustained C^2, and sustained combat support requires attention to details of mission resourcing. Limited resources equal limited flexibility.

The following pages provide base cluster/base commanders and staffs guidance and mission templates for NBC defense operations, NBC reconnaissance, biological detection, smoke, and decontamination operations.

NBC DEFENSE OPERATIONS TEMPLATE

The NBC Defense Operations template (figure D-1) is used to evaluate the enemy's ability to employ WMD against fixed site operations and to delineate the assets required to mitigate WMD effects. This template is used to summarize what is known and not known about the enemy's NBC capabilities and to determine information required. With this information, the staff can perform an NBC Vulnerability Assessment evaluating the impact of NBC attack on base mission accomplishment; site operations (some operations will be more vulnerable to degradation than others); and individual mission performance factors. Finally the template provides a quick reference to the status of units attacked or in the downwind hazard area of an NBC attack. Units are only posted to this last status matrix when they are at risk. When no longer at risk, they may be deleted from the matrix.

NBC RECONNAISSANCE TEMPLATE

The NBC Reconnaissance Template (figure D-2) is used to summarize the reconnaissance missions and organizations charged with hazard detection and monitoring on a base, site, or base area of interest. The mission box lists missions assigned by the base commander for conducting NBC reconnaissance. These assignments can be NBCRS unit missions; missions tasked by higher headquarters to BIDS and LRBSDS teams operating within the base area of operations; or it can be survey and monitoring missions assigned to sector commanders or base tenant activities. More specific base/base cluster NBC reconnaissance missions may include medical treatment personnel collecting specimens from suspect NBC patients for analysis, preventive medicine surveillance of drinking water sources and supplies; and veterinary services surveillance of potential food supplies and government owned animals. The C^2 box highlights the Command and Control relationships between the NBC reconnaissance, surveillance, and survey teams, their locations, and the NAI they will operate in or against. The Communications box provides contact information and the Sustainment box lists critical items required to perform reconnaissance operations. The site commander and staff should study the NBC Defense Operations and the NBC Reconnaissance templates to ensure that areas potentially targeted by the enemy are covered in the base Reconnaissance plan.

BIODETECTION TEMPLATE

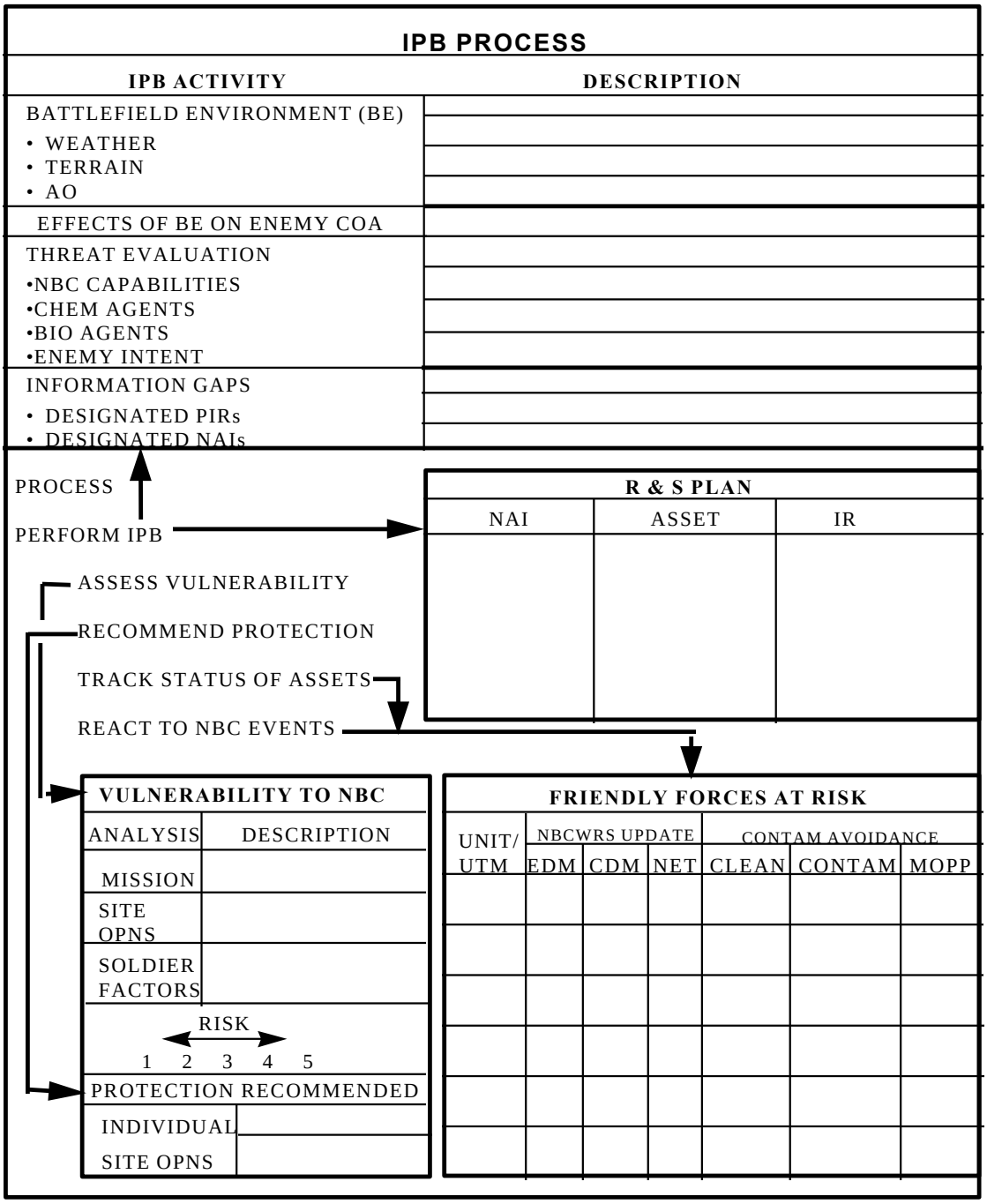
The Biodetection Template (figure D-3) is very similar to the Reconnaissance template except that the Mission block refers to the Corps Commander's mission for biodetection operations rather than the base commander's intent and mission phases. Additionally, the NAI and UTM grid coordinates are generally assigned by the Corps and coordinated with the base commander. Unique sustainment items such as BW detector tickets and BIDS/LRBSDS components are provided through the Biological Detection Company. Common supplies and maintenance may be tasked to the base logistics support operations.

SMOKE TEMPLATE

The Smoke template (figure D-4) helps organize smoke missions assigned to smoke delivery elements including projected, emplaced, and generated obscurants. Combat vehicle self-protection smokes are not included. The Sensor Window box helps the smoke planner determine the precise types of obscurants required to counter enemy sensors. The planner then determines the best distribution of available smoke assets for accomplishing the base's obscuration priorities. Unlike maneuver operations, base smoke missions will likely rely heavily on landline communications for mission C^2. Therefore, both radio frequencies and phone numbers of supported and controlling elements should be recorded.

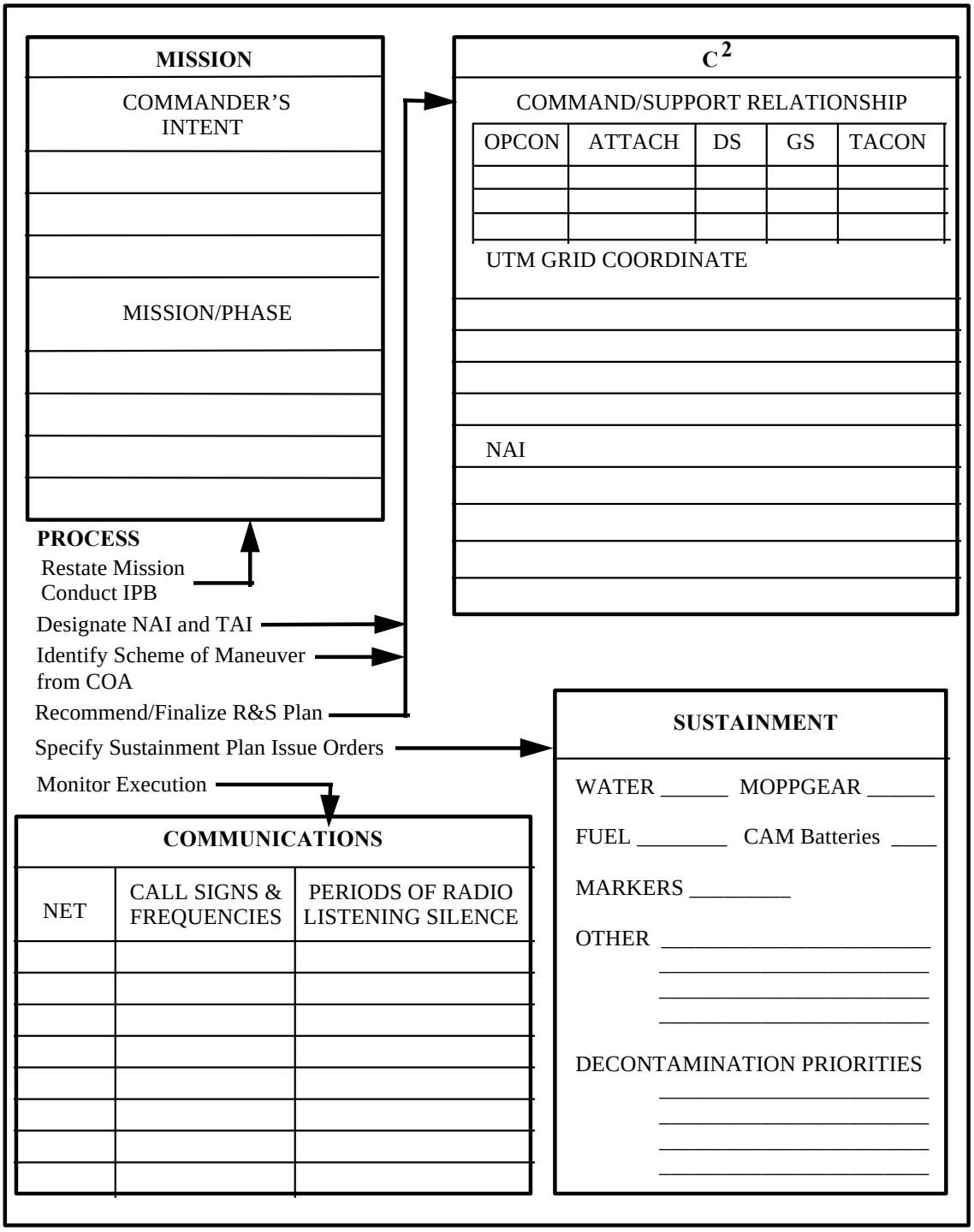
DECONTAMINATION TEMPLATE

The Decontamination template (figure D-5) helps assess decontamination requirements based upon friendly IPB (i.e., how many targets is the enemy capable of attacking simultaneously). Agent type and anticipated quantities drive how much decontamination might be required and is quantified as "required throughput". The C^2 box lists priorities for decontamination based upon the site commanders' assessment of critical activities requiring the most immediate return to normal operations. Additionally, this box specifies decontamination site locations, link-up points, security requirements, and COA affecting decontamination operations. Under the Sustainment window, special attention is required for site closure procedures, as the decontamination site, once used, will remain a hazardous materials site requiring remediation as time and base priorities permit. This template entry should reflect the tentative plan for closure and remediation and confirm notification of the responsible engineer activity.



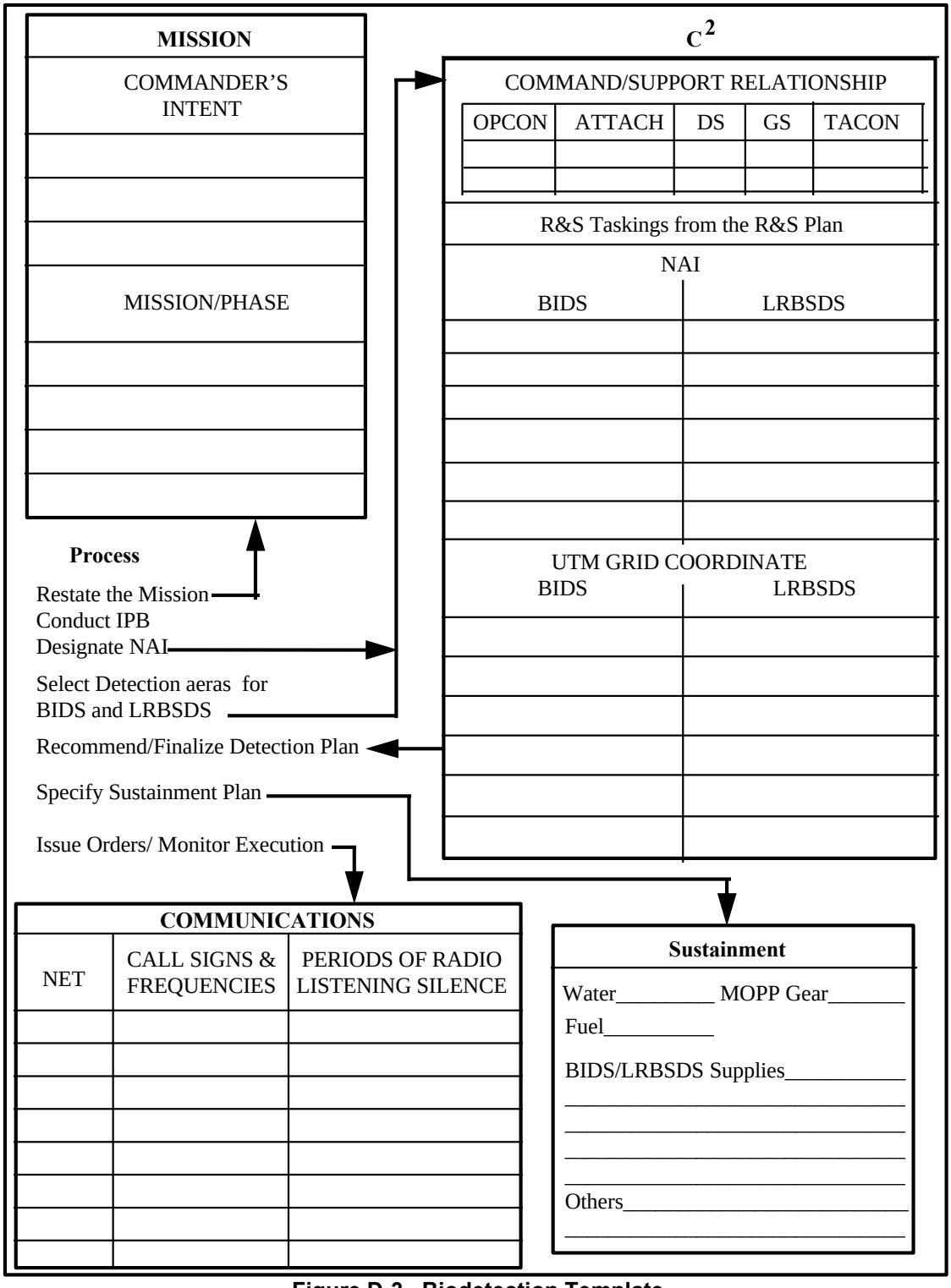
140 **Figure D-1. NBC Defense Operations Template**

141



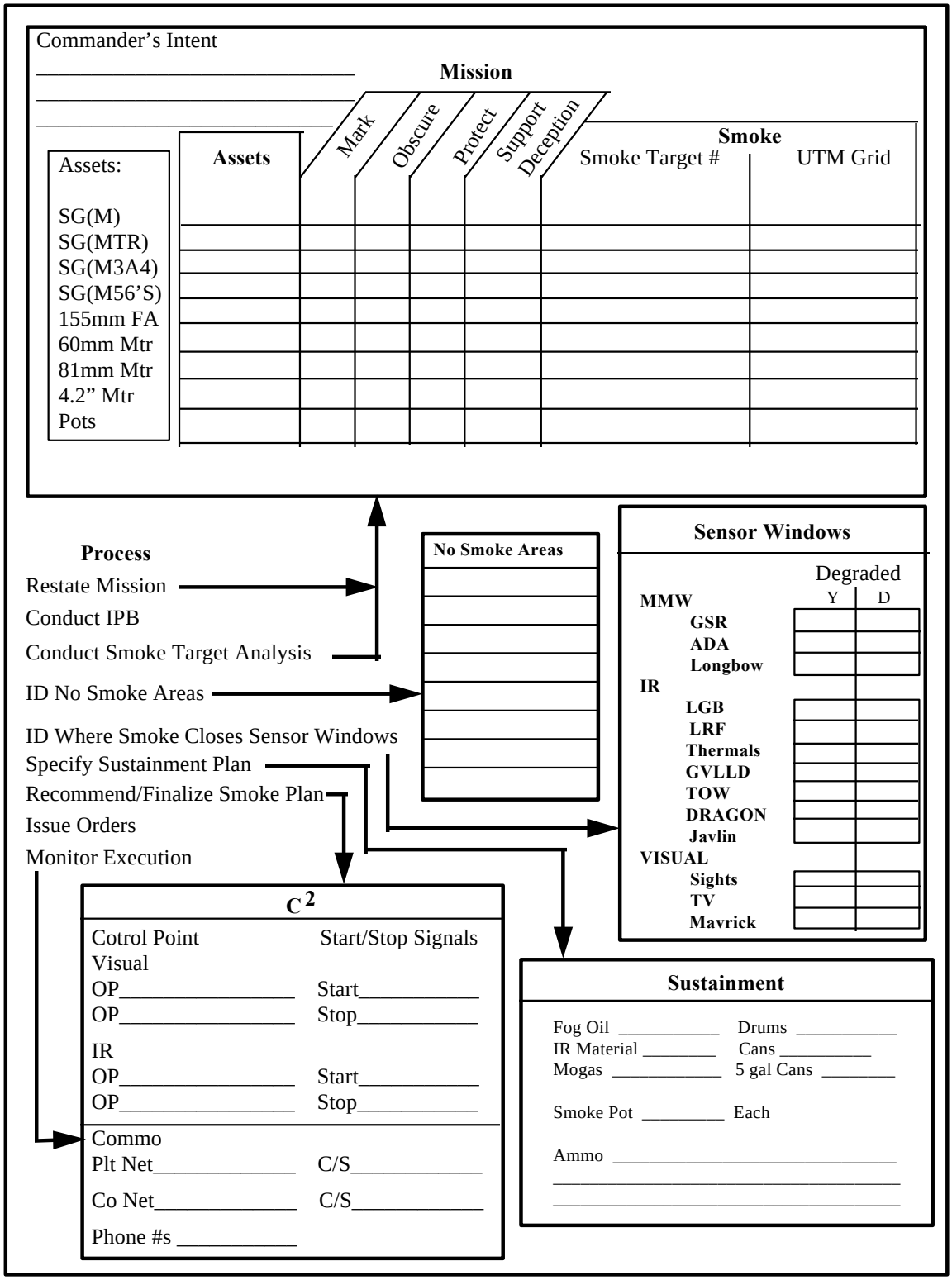
142 **Figure D-2. NBC Reconnaissance Template**

143



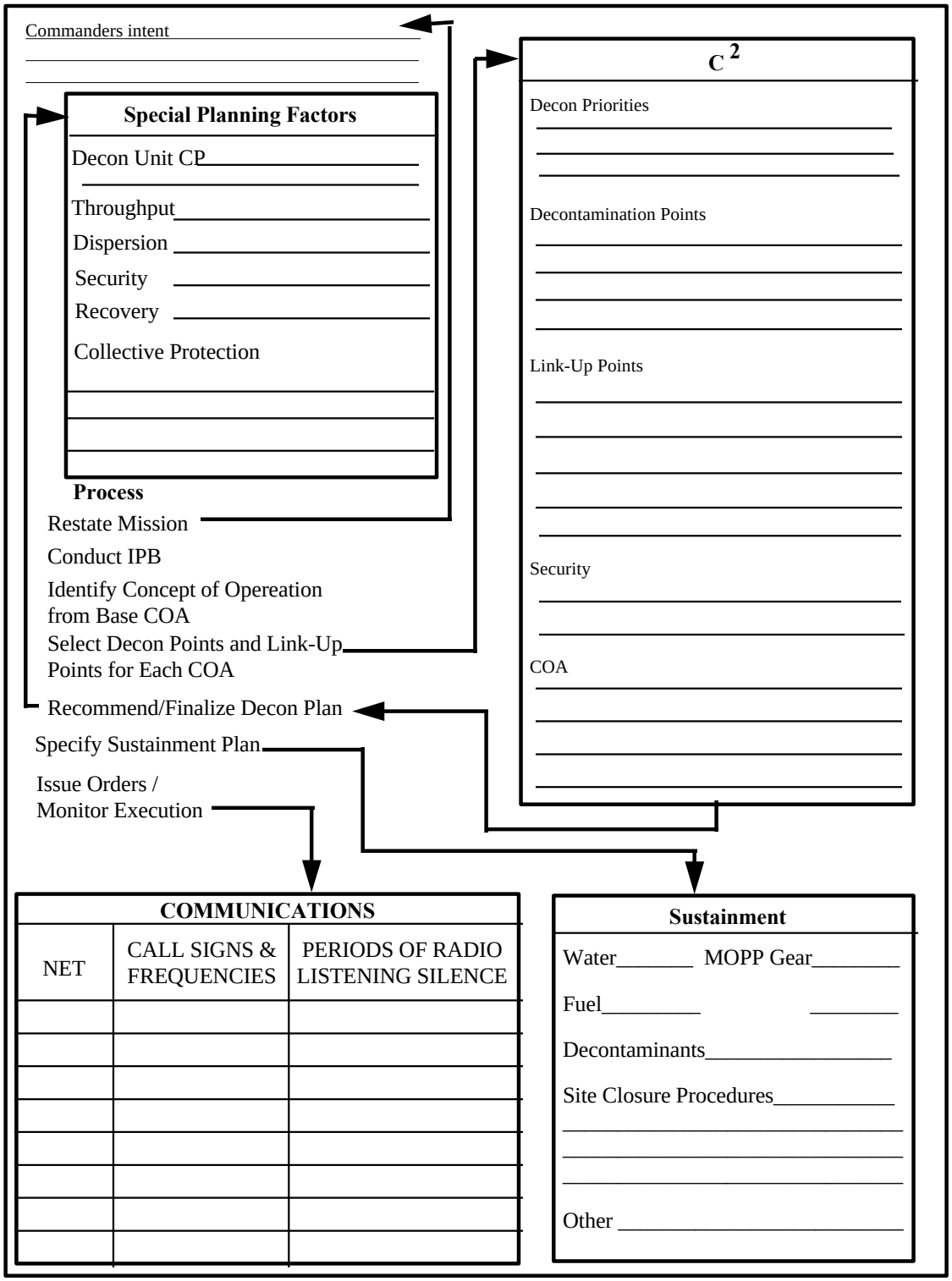
144 **Figure D-3. Biodetection Template**

145



146 **Figure D-4. Smoke Template**

147



148 **Figure D-5. Decontamination Template**

SECTION II.
NBC ANNEX

Use the NBC Annex to clearly define the OPORD NBC defense concept; facilitate mitigation measures to anticipated threat WMD and TIH; and provide details for base support planning and execution. The NBC Annex may include:

GENERAL

- **Standardize times throughout**. Time you've used throughout the order, usually ZULU.
- **List maps, charts, overlays, relevant documents**. May list map sheet series and numbers.
- **Provide maps, charts, and overlays as required with annex**. Maps are normally requested through the S2/G2. Overlays should identify decontamination points; individual protective equipment (IPE) storage and exchange points; field expedient decontamination equipment locations such as firefighting equipment, pumps, dozers; evacuation routes and traffic control points (TCP); casualty collection points; and collective protection shelters.

SITUATION: ENEMY

- **Enemy capability; previous employment; delivery systems; location of stocks**. Describes the enemy's NBC agent capabilities; enemy order of battle and when NBC weapons are most likely to be used; delivery capabilities; and an assessment of where NBC weapons are positioned, e.g., depots, forward deployed.
- **Probability of employment**. Circumstances or conditions supporting enemy use of NBC weapons.
- **Threat to operations area**. Most likely delivery means/agents per anticipated enemy objective(s). Identify fixed site sustainment operations most susceptible to WMD attack.

SITUATION: FRIENDLY

- **Unit NBC defense plans (units)**. Chemical, engineer, air defense, or base defense units with missions that can prevent enemy reconnaissance, protect against NBC delivery systems, or mitigate the effects of NBC attack.
- **Decontamination and reconnaissance resources supporting NBC defense**. Can include NBC reconnaissance and decontamination assets as well as engineer, QM, combat health support, or host nation resources contributing to NBC defense.
- **Potential targets (military and civilian)**. Evaluate each for nuclear, biological, and chemical threats.
- **Effects on civilian communities**. May have major implications for fixed sites relying heavily on civilian workers or commercial operations such as petroleum, oil, lubricant (POL) supply or merchant marine operations.
- **Detection/NBCWRS capability**. Fixed sites must often rely on general support NBC reconnaissance with an area support mission. Additionally, rear area elements typically have fewer organic NBC detection devices and less capable communications for local NBCWRS. Plan, announce, and conduct NBCWRS rehearsals.
- **Attachments and detachments**. List the base cluster/base elements charged with specific NBC defense responsibilities.

MISSION

- **Concise mission statement**. Missions for chemical units supporting fixed sites in a direct support (DS), operational control (OPCON), or tactical control (TACON) role should be

distinguished from those providing general support to fixed sites; most often in the Corps/EAC Rear Area or COMMZ.

- **Purpose (avoidance, protection, decon, smoke)**. Maintain focus on mission and goals: protecting the force, sustained C^2, and sustained combat support.

EXECUTION: COMMANDER S INTENT

Specify how the commander wants NBC defense to support mission objectives (e.g., criteria for success). This may be in quantitative terms of sustained throughput or mission support capabilities (e.g., STON/day, sorties/hour) or specific measures for protecting the force. This may also include Command Protection Guidance: How much risk is the commander willing to take to maintain site operations? This is translated into terms such as 50% of the force will be in MOPP2 at all times, or motorized smoke units will utilize smoke pots for self-concealment.

EXECUTION: CONCEPT OF OPERATION

- **Mission Priorities (1st, 2d, ...).** Establish fixed site support priorities consistent with the mission, commander's intent, and guidance for protecting the force. The base commander or staff should coordinate base NBC defense priorities with the tenant, the tenant's headquarters, and base higher headquarters.
- **NBCWRS.** Procedures must include warning every individual at the fixed site.
- **Site decontamination concept.** Plan/conduct decontamination based on concentrated mission areas/sectors to avoid spreading contamination or waste. Include specific guidance for waste/contamination control at each site.
- **Base/site smoke concept.** Integrate with the overall CCD plan and/or refer to the smoke support appendix.
- **Area(s) reconnaissance concept.** Establish priorities for reconnaissance based on the commander's guidance, potential tenant mission impacts, and most likely targets.
- **Area(s) detection concept**. Detection employment guidance for establishing threat-based detector array incorporating required base/cluster detection assets.

EXECUTION: TASK TO SUBORDINATE UNITS

- **NBC Training Responsibility.** Either a centralized or decentralized approach to ensure adequate training/rehearsals down to section level.
- **Decontamination tasks.** Assign tasks for additional operational decontamination support (MOPP exchange, vehicle spraydown, waste management, or resupply assistance). Identify thorough decontamination support missions/requirements as well.
- **Smoke tasks.** Assign missions to support the smoke concept or refer to the smoke support appendix.
- **Reconnaissance tasks.** Assign tasks to support NBC NAI and/or refer to the NBC reconnaissance/surveillance/monitoring appendix. Develop the reconnaissance plan to mutually support the detection plan.
- **Detection tasks.** Specify detection requirements based on threat WMD employment windows or operations in the vicinity of TIH facilities/hazards. Coordinate detection efforts to create a base/site detector array for maximum detector coverage.

Additional tasks unique to specific units. Self-explanatory.

NOTE: Include example for ITNS support and HN support in this section.

NOTE: Assign tasks per mission requirements/capabilities not by whether units are specifically chemical or non-chemical units. For example: USN construction forces are not equipped for large area NBC reconnaissance; specialized USA and USMC units with the NBCRS (FOX) are best for that mission.

EXECUTION: COORDINATING INSTRUCTIONS

- **Coordination of taskings**. Identifies activities with which coordination must be effected in accomplishing NBC defense operations.
- **Avoidance guidance (areas, food, water)**. Avoidance is less an option for fixed sites than for mobile elements. Good OPSEC, especially counter reconnaissance is vital. This may be manifested in heightened physical security, aggressive external and internal patrolling, or simply locating key activities in areas less susceptible to enemy intelligence collection.
- **Dispersion; cover; protection**. Where dispersion is impractical, greater emphasis must be placed on other protective measures such as camouflage, concealment, and deception. Maximize/prioritize use of NBC covers or general purpose covers.
- **MOPP protection guidance**. Enforcing MOPP and protective measures is more difficult when diverse tenants occupy the same site, especially multi-service and multi-national sites. Achieving consistent masking and unmasking procedures will be a major challenge. Simple inclusion of minimum MOPP as coordinating instruction may not be sufficient. Identify conditions that cause MOPP levels to change (i.e., missile attack and any prescribed MOPP response). IPE serviceability criteria should also be established or reinforced in the OPORD. Plan, announce, and conduct rehearsals.
- **MOPP exchange sites**. Fixed sites may establish consolidated MOPP exchange locations for contaminated personnel. Focus on controlling contamination and disposal of contaminated suits following exchange.
- **Link-up points**. Units or personnel going through decontamination report to a link-up point for traffic control, preliminary instructions, and controlled flow through the site. The supporting decontamination element controls the link-up point. Assign tasking for physical security support, if required.
- **Operational Exposure Guidance**. Maximum radiation dosage a unit or individual is allowed. Identify the turn back dosage for Radiation Survey teams.
- **Troop safety criteria**. Include guidance for NBC defense units operating in non-standard situations such as TIH threats.
- **Collective protection**. Identify the location and priority of use for collective protection facilities.
- **EMP/TREE guidance.** Identify known or anticipated EMP sources and actions to mitigate affects.
- **Medical protection**. Refer to the medical annex for vaccine, pre-treatment, and post exposure guidance.

SERVICE SUPPORT

- **Casualty handling**. Specify base responsibilities/locations for NBC casualty collection points and patient decontamination in the event of multiple-tenant casualties (This is normally a single unit responsibility). Refer to the Logistics annex for graves registration guidance, and ensure graves registration personnel are familiar with contaminated remains handling and decontamination procedures.
- **Field expedient supplies**. Identify location of materials or equipment that can be diverted to emergency NBC defense. OPORD should task owning units with providing support on order.
- **Distribution (how, where, what, when, who)**. Distribution plans, especially those involving civilians, such as: consolidated CDE storage with command designated issue times or immediate individual issue to all base support personnel. Address CDE issues such as uneven distribution of CAMS or other detectors throughout the base. Require CDE asset reporting to obtain/maintain asset visibility.
- **Maintenance**. Address unique DS/GS NBC maintenance requirements such as FOX or BIDS.
- **Petroleum, oil, lubricants (POL)**. Specify NBC defense unit procedures for acquiring POL when detached.

- **Consumption rates (each mission/task)**. Establishes limits on consumption, usually based upon replenishment capabilities.
- **Resupply delivery (times, location, what, how much)**. Establishes whether supplies will be pushed all the way to the site, or if units pick-up supplies at offsite logistics resupply points. Where possible, consolidate resupply requirements to conserve transport resources.
- **Prioritize Tasks for Support.** . Based upon mission, commander's intent, and command guidance.

COMMAND AND SIGNAL

- **Control procedures**. Establish who controls NBC defense operations and chemical units operating on or near the fixed site (e.g., site S3/G3). If supporting only part of a site's tenants, identify where other units obtain NBC defense support.
- **Frequencies and signal operating instructions (SOI) designation**. Identify radio nets for supporting chemical units. Fixed sites will rely heavily on telephone for on-site communications.
- **Command post (CP) locations**. Identify controlling CP for chemical units and all fixed site tenants' CP.
- **NBCWRS**. Include network diagram, a simple sketch portraying information flow requirements (up, down, and laterally) and any special/designated frequency requirements. If tenants are not clear on standard NBC warnings/alarms, state specific actions/reactions.

SECTION III.
FIXED SITE NBC RECON/SURVEILLANCE/MONITORING APPENDIX TO NBC ANNEX

GENERAL

- Same as NBC Annex except:
- **Charts and Overlays**. Provides a graphic overlay of the fixed site or base indicating high value targets, NBC surveillance and monitoring locations, and NBC survey team routes.

SITUATION: ENEMY

- Same as NBC Annex.

SITUATION: FRIENDLY

- **Base NBC Reconnaissance, Biodetection, and Survey Teams**. List attached, OPCON, or TACON NBCRS elements; supporting biodetection teams, if any; and NBC survey teams with base or sector responsibilities.
- **Medical surveillance**. Identify medical activities with capabilities for identifying/treating NBC casualties or contamination. (Medical units are authorized a high density of CAM by CTA. Additionally, they have radiation safety specialists).
- **Potential Targets**. Reconnaissance, surveillance, and monitoring plans should coincide with fixed site assessment of targeted base activities.
- **Attachments and detachments**. NBCRS (FOX) teams and Biological Integrated Detection System (BIDS) teams attached, OPCON, or TACON to the base. TACON elements may be used for specified tactical missions but may not be assigned other missions without approval of the assigning headquarters.

MISSION

- Same as NBC Annex except:
- **Monitoring and Survey Party Missions**. Identify monitoring and survey party missions assigned to tenant activities. May be assigned by base defense sectors or by potential target areas.

EXECUTION: COMMANDER S INTENT

- Criteria for Success.

EXECUTION: CONCEPT OF OPERATION

- **NBCRS priorities (1st, 2d, ...).** C^2 should generally remain with one base activity with the FOX teams placed TACON or OPCON to other tenants as necessary.
- **NBCWRS**. Establish warning and reporting procedures for all designated reconnaissance, surveillance, and monitoring activities. Once time-sensitive information is collected, identify who needs that information first. Implement a warning and reporting architecture that permits the rapid transmission of NBC surveillance findings to the base defense operations center and to activities in downwind hazard areas.
- **Areas (Reconnaissance, detection, monitoring).** Specify areas to be reconnoitered and monitored and the conditions that trigger these operations. May be peak threat periods, after a suspected attack, or “on-order”.

EXECUTION: TASKS TO SUBORDINATE UNITS

- **General guidance.** Provide unit/element task requirements such as responsible NAI and periodic requirements. Assign “On Order (O/O)” missions.
- **Specific guidance.** Issue specific reconnaissance, surveillance, or monitoring guidance by separate FRAGO as required.

EXECUTION: COORDINATING INSTRUCTIONS

- Rehearsals. Because of the numerous tenants on a base and various mission priorities, orchestrating recon and surveillance will be a major challenge for large fixed site commands. Rehearsals and team training will help eliminate problems.
- MOPP Protection. Specifies protection levels for detection, monitoring, and survey teams required to seek out contamination. Protection level is likely to be higher than the remainder of the site.
- OEG from Commander. Radiation survey teams operating in nuclear areas require operational exposure guidance to avoid over-exposing party personnel.
- Contamination Avoidance guidance. Initial guidance may be to locate contamination boundaries only, leaving complete contamination measurement until a later time.
- Reports. Establishes reporting requirements for reconnaissance and survey teams and monitoring sites. Regularity of reports as well as reporting channels should be articulated. Channels may be different from normal chain of command. Base sector commanders are likely to be responsible for all tenants within the sectors.

SERVICE SUPPORT

- Same as NBC Annex.

COMMAND AND SIGNAL

- Control Procedures. The operations center staff focus all reconnaissance, surveillance, and survey reports and recommend courses of action to mitigate WMD effects. Sector/tenant activities report to the base operations officer and request decontamination, reconnaissance, or MOPP exchange support, where these functions are controlled by the base commander.
- Communications. Same as NBC Defense Annex.
- NBCWRS. Same as NBC Defense Annex.

SECTION IV.
SMOKE SUPPORT APPENDIX TO NBC ANNEX

The Smoke Support Appendix provides site protection tools for developing a site camouflage, concealment, and deception (CCD) plan of which smoke support is a component. CCD for fixed sites generally includes a combination of hiding, blending, disguising, disrupting, and decoying to reduce an enemy's ability to acquire, identify, and effectively engage fixed site targets.

Smoke is usually perceived as working against visual target acquisition. However, modern smokes and obscurants work against visual and infrared spectrums, with millimeter wave (MMW) obscurants currently under development. Smoke and obscurant uses discussed below focus on fixed site use against both ground and aerial threats. Use the smoke appendix to provide detailed planning, preparation, execution, and sustainment of smoke operations.

GENERAL

- Same as basic OPORD.

SITUATION: ENEMY

- **Enemy electro-optical system threat**. List sensors and weapon systems the enemy might employ against fixed sites.
- **Enemy RSTA**. List enemy reconnaissance, surveillance, and target acquisition (RSTA) capabilities, and their reliance on visual and/or infrared sensors.
- **Types of smoke; delivery systems; stocks**. List enemy obscurants, capabilities, and delivery means.
- **Probability of smoke use; locations; type smoke; probable routes**.

SITUATION: FRIENDLY

- **Assets to be used and availability**. By enemy RSTA system, list friendly smoke and CCD capabilities to inhibit enemy capability, and friendly systems availability. List other available CCD measures.
- **Attachments and detachments including smoke security assets**. It is unlikely that sufficient large area smoke assets will be available for complete fixed site protection. Consequently, base/base cluster commanders may distribute attached elements to sectors or activities within a base.

MISSION

- **Identify unit(s) to conduct smoke missions**. Large area smoke missions must be assigned to a specific smoke delivery unit. Attached, DS, OPCON, or TACON are the preferred command relationships so that the smoke control officer receives orders from one supported unit controller.

- **Smoke requirements, location, time (start/stop)**. Smoke type options are: visual, infrared (IR), or multispectral. Smoke intent options are: (1) Screen (smoke between enemy/friendly force or in friendly area; (2) Obscure (smoke on/or in front of enemy); (3) Protect (defeat enemy guidance systems or decrease nuclear thermal effects); and (4) Mark. Smoke density guidance includes: (1) Haze; (2) Blanket; and (3) Curtain.
- **Purpose**. Why? Cover advance, movement, withdrawal, decontamination site.

EXECUTION: COMMANDER S INTENT

- **Criteria for success.**
- **Mission intent (conceal, blind, mark, protect, deceive)**. Smoke should not be used in isolation. Combine smoke with other CCD measures. Use smoke to help canalize enemy aircraft into air defense kill zones.

EXECUTION: CONCEPT OF THE OPERATION

- **Asset employment**. If smoke is used in defense against ground attack, consider using smoke on avenues where economy of force measures are required. If used against manned aircraft attacks, ensure that smoke unit cueing takes place well in advance so that screens can build in time to conceal desired smoke targets prior to enemy aircraft arrival. Attempt to conceal recognizable features that provide cues to attacking pilots (e.g., airfield interactions, towers, berthed vessels, port berths or cranes).
- **Selected delivery systems mix**. Specify priorities for type smoke to be used and delivery systems (e.g., emplaced, projected, or large area smoke).
- **Mission priorities (1st 2d, ...)**. Prioritize smoke delivery based on overall command priorities. From the air, smoke attracts attention and at 600 mph, even split second diversions may result in inaccurate or ineffective ordnance delivery.

EXECUTION: TASKS TO SUBORDINATE UNITS

- **Employment (generator, projected smoke, smoke pots)**. Where and when is smoke required? How long must the cloud be sustained. Wind direction is not nearly as critical for projected smoke although collateral damage may be a concern due to phosphorus content.
- **Mission specific requirements for each task**. Must analyze the types of sensors to be degraded so that the correct type delivery systems and obscurant materials are available to perform the obscuration mission.
- **Targets (priority assigned)**. Target priorities should take all CCD measures into account. Refer to the OPORD CCD Annex, if included.
- **Time start/stop smoke**. Where a combination of visual and infrared obscurants are to be used, start and stop times must be specified for each.
- **Locations (primary, alternate)**. For bases and base clusters, this list may be extensive due to the number of separate smoke targets to be protected.
- **Security support**. Off base deception operations may require security or at least designation of security reaction forces.

COORDINATING INSTRUCTIONS

- **Smoke (start/stop, who initiates where)**. Multiple smoke targets at ports, airfields, and large base clusters will present unique C^2 problems. Establish procedures to communicate between various control officers when smokes overlap or infringe on unintended operations.
- **Target list (maps, overlays, coordinates)**. The base commander should approve all target nominations on or around a base.
- **Delivery schedule (time each task)**. Where projected, emplaced, and generated smokes are to be integrated, the plan must prescribe when each delivery method will be employed.

(NOTE: The implication is that base defense/ground base defense are different. If you want to differentiate between smoke and infantry - needs to be clearer.)

- **Movements, transportation, security**. Mobile smoke generators have reduced problems associated with repositioning of smoke generators. Smoke units with base defense smoke missions should not be double committed to ground base defense roles.

SERVICE SUPPORT

- **Future requirements**. Do present assets allow for future or sustained smoke operations? The OPORD may specify, "Be Prepared" missions for smoke elements.
- **Resupply availability**. Pre-positioning of obscurant supplies will allow for long smoke mission duration and can accommodate generator repositioning due to wind shifts.
- **Distribution (how, when, where, what, who)**. Decentralized supply operations should be the rule on larger fixed sites, especially when smoke squads are detached from smoke platoons.
- **Transportation of POL**. Normally POL is obtained from the supported fixed site. The plan should address special coordination required to obtain fog oil/graphite through supported units.
- **Maintenance (smoke assets, vehicles)**. Elements smaller than platoons should obtain common item organizational and higher level maintenance from a fixed site tenant activity. Unique smoke generator maintenance may require attaching additional maintenance personnel to the site maintenance organization.
- **Activities providing support (classes of supply [who, when, where, what, how])**. Support for smoke elements operating independent of their parent platoon should be addressed.
- **Consumption rates (each mission task)**. Should be calculated for each type obscurant and for each smoke target at the site. (NOTE: Smoke elements make this calculation as a matter of course - then communicate needs to supported unit - or is that what you're trying to say.)

COMMAND AND SIGNAL

- **Smoke control officer (who, where, unit contact instructions)**. Each smoke operation at a base or base cluster requires a smoke control officer. Additionally, because one or two generators may be used to provide smoke on fixed sites, smoke control officers may be required from the supported unit.
- **Smoke control point.** Location of the smoke control officer.
- **Frequencies and signal operating instructions (SOI) designation**. Due to lack of radios in rear area units, hardwire communications may be the preferred communications method for fixed site smoke operations.
- **Command post (CP) locations (primary, alternate)**. Locations for each activity supported should be designated along with locations of other CCD providers.

APPENDIX E
FIXED SITE NBC DEFENSE EXECUTION TOOLS

OVERVIEW

Passive defense measures for fixed site NBC defense are responses to anticipated or actual NBC attack and toxic industrial hazard (TIH). One of the most useful NBC defense tools resulting from the planning process is a synchronization matrix for the execution of NBC defense tasks.

A NBC Execution Matrix at figure E-1 and a Smoke Execution Matrix at figure E-2 is provided as a basis to begin the process of synchronizing unit efforts in support of the NBC defense tasks . These matrices demonstrate only the logic process that must consider specific threat/mission scenarios. These matrices are developed from OPORD taskings, and identify specific events which must occur for mission success, such as:

- The matrices identify hypothetical task/events and supporting unit taskings from the OPORD to support the example execution matrix.
- The example entries from the OPORD are only conceptual and should not be construed as all that are needed or extrapolated as is for a specific tasked event.
- Task/Event entries and taskings must conform to mission-specific influences such as threat, task organization, command guidance, unit capabilities, and the NBC defense mission (decontamination, reconnaissance, smoke).
- Remarks are included and may address specific requirements and command and control information not included in the task/events columns.

A blank matrix for use in developing entries to support specific threat/mission scenarios in support of the NBC defense taskings is provided at figure E-3. The Task/Event column and task columns in figure E-3 are blank since each matrix will have different user-identified events to be supported as well as individual unit taskings.

ANNEX H Chemical-Biological Support to OPORD 3-38-97 DTG 124030 Mar 97

MISSION: Operate PORTSMOUTH port terminal to receive equipment and supplies for JTF Barker and to retrograde equipment as necessary. 14th Chemical Company provides GS decontamination to the port; the 92d Chemical Company (-) provides GS NBCRS reconnaissance and DS smoke generator support.

	Phase	A	B	C	D	E
LINE	**Task/Event**	Establish JTF Port Ops	Offload Ops	Storage Ops	User Staging Ops	Inland Clearance Ops
1	**NBC Threat**		SCUD w/ persistent nerve & blister	SCUD w/ persistent nerve & blister	SCUD w/ persistent nerve & blister	Persistent agents along LOC
2	**Templated Threat**	Intel Agents and Saboteurs	Ship/MHE/Cgo contamination; personnel 2^{o}; NAI 3	Contamination of equip/ supplies; personnel 2^{o}; NAI 7	Contamination of equip/ supplies; personnel 2^{o}; NAI 2,6	NAI 14, LOC chokepoint
3	**NBC Vulnerability**		**Moderate;** however, requires 5-8 missiles to cover tgt area	**Moderate;** however, requires 5-8 missiles to cover tgt area	**Limited**	**Moderate**
4	**Decon Site Grid**		Use on board and dock pumps to flush	Decon 36 NK 415116	Decon 37 NK 409128	Decon 38 NK 410120
5	**Link-up Point Grid**			LU 36 NK 417112	LU 37 NK 405127	LU 38 NK 411118
6	**Decon Support**		Use on board and dock pumps to flush	14th Cml Co establishes and mans site on receipt of OPORD; 1st priority msn	14th Cml Co (-) provides decon O/O; 2d priority	14th Cml Co (-) provides decon O/O; 3rd priority
7	**Smoke Support**		Smk Plt in DS to terminal OIC. Visual/IR O/O	Smk Plt in DS to terminal OIC. Visual/IR O/O	Smk Plt in DS to terminal OIC. Visual/IR O/O	
8	**NBC Recon Support**	Provide 2 Foxes for TIC and area recon	Provide M21 overwatch of berthing areas 1 and 3; O/O recon to verify/define	O/O Recon storage areas for contam vic NAI 7	O/O Recon staging areas vic NAI 2 and NAI 6	O/O Recon NAI 14
9	**BIDS & LRBSDS**	Recommend BIDS/LRBSDS NAIs to the Corps G2				Request LRBSDS during high threat periods from NK 3612 to NK 4620
10	**MOPP**	ZERO	ZERO	TBD	TBD	TBD

Remarks:
BDOC will recommend position for BIDS vicinity of wharf operations. Request BIDS/LRBSDS support from Corps G3/CmlO if threat escalates.
14th Chemical Company establishes CP vicinity NK 4509.
92d Chemical Co (-) establishes CP vicinity NK 3612.

O/O = On Order
2^{o} = Secondary

Figure E-1. Example NBC Execution Matrix

30

ANNEX F		Smoke Support to OPORD 3-38-97				DTG 124030 May 97
MISSION: 21 Chemical Company (DP) provides smoke and decontamination support on an area basis to Giebalstadt Army Airfield, vicinity PC 2465 to protect against ground and aerial attack.						
Phase		**A**	**B**	**C**	**D**	**E**
LINE	**Task/Event**	Support ground defense ops in sector 23 vic PC 236610	Support ground defense ops in sector 27 vic PC 239639	Conceal acft revetments vic PC 247624 using CCD measures	Disrupt atk profiles from N vic PC 2353 to PC 2552	Conceal runway intersection vic PC 242661
1	**Enemy EO Systems Threat**	Optical day sights and poor quality image intensifiers	Optical day sights and poor quality image intensifiers	MMW radar, thermal imagers, and visual sights	Visual and inertial NAV aids	Visual, MMW, radar, and NAV aids
2	**Enemy Weapon Systems to be Degraded**	AT 5-6 ATGM and BTR/BMP/ BRDM	AT 5-6 ATGM and BTR/BMP/ BRDM	SU-25/MIG-29 acft, MI-24 helicopters	SU-25/MIG-29 acft, MI-24 helicopters	SU-25/MIG-29/ MIG-21 acft
3	**Enemy Smoke Use**	Enemy smoke in lines 5 to 1 km in front of defense	Enemy smoke in lines 5 to 1 km in front of defense			
4	**Friendly Smk Delivery Systems**	Have limited 4.2" mortar smk, pots, & 2 gen	Have smk pots and 4 gen	Use Smk Plt (-) 4 gen, and CCD	Use Smk Plt, pots	Use Smk Plt (-), 2 gen, and pots
5	**Type Smoke & CCD Required**	4.2" mortar visual	Visual	Visual until enemy 10 km out, visual & IR during atk	Visual and air defense decoys, radar reflectors	Visual, IR, and MMW decoys
6	**Smoke Target Area**	High speed ave. from PC 255641 to PC 236610	Area NE of Gate 7 vic PC 241650	Revetments vic PC 247624	PC 2353 to PC 2552.	Runway intersection vic PC 242661
7	**Smoke Purpose**	Disrupt attack formations	Economy of force in sector; delay enemy	Acft survivability against surprise attack	Canalize enemy into AD kill zone; protect AD site vic PC 271510	Decrease enemy visual & laser guided bomb accuracy
8	**Start/Stop Times**	Visual O/O when enemy 5 km out; duration 10-min	Visual O/O when enemy 7 km out; duration 35-min	Visual & IR O/O; duration 15-min.	Visual O/O; duration 25-min.	Visual & IR O/O; duration 10-min
9	**Smoke Control Officer**	Sector 23 FSO	3d Plt Ldr, 21st Cml Co	2d Plt Ldr, 21st Cml Co	1st Plt Ldr, 21st Cml Co	312th TFW designated OIC
10	**Smoke Sustainment**	Pre-position 4.2" ammo for four 10-min missions	2-hours Visual	1-hour Visual, 1-hour IR	2-hours Visual	1-hour Visual, 30-min IR
Remarks: Smoke pots will be used to conceal all generator locations as well as for rapid buildup of clouds. Masks will be worn when working within HC smoke clouds. At least 5-minutes buildup is required for tasks B through E.						O/O = On Order

31 **Figure E-2. Example Smoke Execution Matrix**

ANNEX_____	NBC Support to OPORD_____	DTG_____

MISSION:

	Phase	A	B	C	D	E
LINE	**Task/Event**					
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						

Remarks:

Figure E-4. Blank Matrix

APPENDIX F
HOST NATION AND CIVILIAN CONSIDERATIONS

OVERVIEW

Fixed sites, ports, and airfields outside the United States are established and maintained by agreements and memorandums of understanding between the U.S. and the host nation (HN) government. These installations assist in the implementation of U.S. policy during peacetime, in humanitarian assistance operations, and in sustaining the force during conflict. Once established, fixed site operations rely heavily upon Department of Defense (DOD) Civilians and Non-DOD Civilians (Contractors, contract employees, and HN local hires) to conduct day-to-day operational mission activities. DOD, non-DOD, and HN civilians play vital roles in fixed site planning and operations and in operational mission accomplishment, providing prompt and sustained support in times of peace and conflict. Disruption in their functional capacity will adversely impact fixed site operations at critical periods.

ORGANIZATION, ROLES, AND RESPONSIBILITIES

U.S. Embassy. The U.S. Ambassador is the senior U.S. official to the HN, and is directly responsible to the President of the United States in carrying out U.S. policy. Embassy organization and duties of embassy officials support implementing U.S. policy. The U.S. Ambassador and embassy staff are direct links to the HN government and can provide the means for acquiring HN assets in support of fixed site operations. U.S. Embassies also develop and maintain Emergency Action Plans (EAP) that should be considered during fixed site planning. Embassy staffs maintain liaison with all elements of the HN to include, government, intelligence, influential citizens, labor and political leaders, populace, and industry. As such their offices provide expedient lines of communication with the HN government to expedite approval for changes and additions to fixed site operations; clearing political, economic, and religious obstacles which may arise; authorizing the use of HN assets on a timely basis; and negotiating labor disputes with laborers.

Fixed Sites. Bases may need personnel from the HN to perform immediate and long-term functions, such as laborers, stevedores, truck drivers, supply handlers, equipment operators, mechanics, linguists, medical aides, computer operators, and managers. These may be available from a HN labor pool. The HN may also provide military or paramilitary units to support U.S. forces by performing traffic control, convoy escort, base security, and cargo and troop transport duties. However, HN support is highly situational and heavily dependent on operational capabilities of the HN and its support for U.S. policies. Commanders, using civil affairs personnel, must determine functional types and levels of HN support that can be accepted with a high assurance that the HN will be able to meet commitments. For example, civil affairs personnel in conjunction with their counterparts in the HN would make the following determinations: Is the labor force stable and adequate to provide needed resources for daily operations and to fulfill surge requirements? Is military security competent to quell spontaneous and organized actions directed at the fixed site and toward U.S. personnel and civilians? Are translators competent to act as intermediaries with a high assurance of correctly enunciating and relating all positions correctly? Is there a high assurance that HN personnel filling critical positions will continue in the capacity during periods of instability? Will the HN provide and sustain required resources? Some HN planning factors to consider are outlined in table F-1.

Table F-1.

HOST-NATION SUPPORT PLANNING FACTORS
• **Capability, dependability, and willingness of the HN to provide and sustain resources.**
• **Shortfalls in U.S. forces supplemented by HN support and reductions in U.S. forces made possible by using HN support.**
• **Effects of HN support on morale, both HN and U.S.**
• **Effects on security, to include operations security.**
• **HN international agreements and treaties that specify U.S. involvement in the area of operations.**
• **Capability of U.S. forces to accept and manage HN support.**
• **Availability of HN support in the type and quantity agreed upon across the range of military operations.**
• **Capability of U.S. forces to supplement and assist HN forces executing rear area operations.**

The fixed site commander is responsible for mission readiness of the fixed site and for maintaining physical security and force protection.

Mission readiness of the fixed site. Key to fixed site mission readiness in this vulnerable environment is ensuring the site and its personnel are organized, equipped, trained, and available even when subjected to acts of civil disorder; terrorists activities; and/or employment of WMD or TIH. This requires:

- Organization. Organize tenant units to support the base cluster/base NBC defense plan. Integrate HN assets as available to complement base cluster/base defense and minimize threat actions. Obtain additional support from transient units not yet tasked with other missions.
    - Establish and maintain NBC Emergency Response Standing Operating Procedures (SOP) involving fixed site assets and integrated HN assets. Fully commit, but do not over commit assets.
    - Organize Emergency Response Teams (ERT) from all fixed site tenants to reduce the probability of damage and minimize the effects from WMD, TIC, or disasters.
    - Maximize use of available time through site preparation, task organizing, assigning objectives and sectors, effective C^2, and use of redundant lines of communication with ERT and other response forces once engaged.
    - Know your key personnel and understand their availability in time of crisis. Key personnel include supervisors, key technical staff, and linguists.
    - Establish HN security assets in primary role, but provide for planned backup from fixed site assets.
    - Establish group of selected subject matter experts from fixed site staff and tenant organizations to liaison with embassy staff and interface directly with HN to increase NBC defense awareness and expedite support and logistics requirements.

- Equipment. Establish mission essential equipment requirements for NBC defense. Allocate available supplies and equipment to support the requirement.

    - Determine types and quantities of supplies and equipment needed to support the plan (e.g., decontaminants, IPE, CPE, engineering, communication).

    - Determine requirements of what to issue, to whom, when, and training required when issued.

    - Determine most suitable distribution method to support the NBC defense plan (e.g., unit issue, consolidated location, dispersed locations). Consider storage requirements, hardening from effects of NBC hazards; fires; deterioration; weathering effects; security requirements; availability; affect on plan if not available as needed.

- Training. Specify and accomplish training objectives. Determine training resource requirements; equipment/supply support.

    - Leader Training. Train in NBC defense conditions that support the base cluster/base NBC defense plan. Focus training and add complexity and difficulty to METL training and NBC defense requirements. Train in common NBC tasks and in use of work/rest cycles to sustain maximum NBC defense readiness condition in stressful and lethal situations. Know the mission and evaluate units capability to effectively respond.

    - Individual Training. Train in common NBC tasks (individual decontamination, masking, MOPP, NBC recognition, warning and reporting). Train to support the NBC defense plan. Make training tasks progressively harder as personnel training level/knowledge rises.

    - Collective Training. NBC collective tasks are part of the unit training plan or are tasks derived from the METL. To save valuable training time and effort, determine which tasks support more than one mission essential task. Also, determine which essential tasks must be trained in an NBC environment. Identify tasks that:
        - Should not be done in a contaminated environment.
        - Can be done by increasing MOPP.
        - Must be done, but execution rates in MOPP are unacceptable. These tasks become the focus whereby plans (SOP) describe how operations will be different under NBC conditions.

- Train NBC defense teams to perform their NBC defense plan function. Tactic, technique, and procedure (TTP) differences in training, doctrine, and equipment may require training adjustments. Working with HN and/or coalition forces requires consideration of challenges such as: equipment, material, manpower, language, doctrinal, political, and social differences.

- Rehearsals/Drills. To insure interoperability under NBC conditions, training should replicate conditions in an NBC environment. These rehearsals and drills serve to answer questions, such as:

    - Is the plan task-organized properly; does all equipment function according to plan; who will conduct decontamination; who will conduct survey?

    - Are mission assignments appropriate for units' capabilities; is mission support needed and available?

Rehearsals, drills, and exercises conducted between joint, coalition, and HN forces create rapport and establish relationships; create a degree of standardization and economy of resources; establish understanding, and focus leaders on common goals. This strengthens and reinforces teamwork and surfaces problems that must be clarified/amended.

- Availability. Regardless of the environment, critical personnel must be available to accomplish the mission. Radical changes can occur without adequate warning (Iran takeover of the U.S. embassy); therefore, plans must take into account items, such as:

    - Recall rosters. Tenant units establish and maintain rosters for immediate notification of site personnel, contract civilians, and HN civilians. Rosters may be selective based on need (e.g., surge operations, alert team response training, security alerts). Enforce established response times to ensure critical functions are maintained.

    - Non-Combatant Evacuation Operations (NEO) Plans. The Department of State (DOS) and the chief of mission (COM) (the U.S. Ambassador to the HN) are primarily responsible for NEO. The COM formulates NEO plans to evacuate noncombatants and nonessential personnel from the HN. These plans should address NEO under NBC conditions and may require DOD support with issuing protective equipment and providing instruction in its use. The establishment of WMD employment indicators that "trigger" evacuation is critical.

    - Contingency Plans to Backfill. Selecting replacement personnel or Identifying returning personnel is key to maintaining or restoring full mission complement.

- Civil defense preparedness. Establish and maintain operational and hardened collective protection shelters; mission essential personnel designations; non-combatant evacuation routes; and personnel and equipment staging areas.

Maintaining fixed site physical security and force protection. This includes involvement of DOD/non-DOD civilians, HN civilians/international workers, and the HN government. These personnel support the site's ability to react, survive, repel, recover, and continue the mission.

COMMAND AND CONTROL

NORMAL OPERATIONS

Fixed site commanders plan for day-to-day mission activities and provide for the needs of DOD/non-DOD civilians (contractors, contract employees, and local host nation and guest workers) and dependents who may be authorized on-site. Realistically, planning addresses both the most current probable threat and reasonable expectation of future threats. Use staff planning priorities to distinguish essential requirements from those that are merely desirable. Host nation and civilian considerations might include:

Status of Forces Agreement. International law permits a sovereign power to prosecute nonmilitary offenses committed within its borders by members of a visiting force. This power may be further defined or surrendered to military authorities through Status of Forces Agreements (SOFA) and other treaties or agreements, depending upon the nature and circumstances of the offense that has been negotiated between the US and HN. Each SOFA is different. See Service publication for subjects that may be covered.

In addition to the SOFA, a memorandum of understanding (MOU) may be negotiated between the US and the HN concerning specific items not covered in the original SOFA.

Supplies, Services, and Equipment.

- Use HN facilities for hospitals, headquarters, billets, warehouses, and maintenance shops. Balance HN resource availability and capability with HN requirements.

- Plan for and make available adequate, safe housing for personnel designated as operationally essential, such as DOD employees and non-DOD civilian personnel, and contract workers. Determine unique shelter requirements and the extent to which they can be supported.

- Consider HN support for special functions, such as rail operations, convoy scheduling, air traffic control, harbor services, fire, and security. Personnel services require forward planning for efficient and economical use of limited US resources.

- Consider HN resources and contingency contracting for special equipment and NBC defense support (e.g., decontaminants, fire fighting equipment for decon support, protective covers). Local purchases of supplies and services may reduce logistics requirements. Such purchases must consider relative abundance of required item(s) and HN needs.

- Use Civil Affairs teams to contract for HN support; establish C^2 agreements between the HN element and the fixed site commander; and contract with the HN to provide CDE, Class II, III, IV, VII support and support items which may be unique to the HN.

NBC Protection and Physical Security. These considerations are extremely important with respect to avoiding or protecting against terrorist WMD and TIH threats.

- Maintain linkage with intelligence staffs. HN agencies are normally excellent Human Intelligence (HUMINT) and Counter Intelligence (CI) sources. Maintain effective links with HN police, military, and paramilitary agencies.

- Use civil affairs personnel and embassy staff liaisons to maintain contacts with HN agencies. These activities can assist and coordinate efforts to identify: HN support for TIH sites; threat information; political personnel and media with friendly or opposition views; and routes, holding areas, and supply points. HN agencies will generally assume responsibility for countering actions of indigenous personnel.

- Psychological Operations (PSYOPS). PSYOPS activities have the ability to quickly assist HN agencies in dispensing Civil Defense (CD) response actions and CD warnings to areas affected by TIC release, terrorists activities or WMD actions.

- Agreements. Support agreements will delineate HN prerogatives and may designate that U.S. and supporting HN commanders retain command of their respective units, creating synchronization and execution challenges.

- HN Support. Base Cluster/Base commanders determine the type and degree of HN support required during periods of increased tension and/or conflict. HN may continue to provide all security or share support responsibility with U.S. forces.

- Alarm Networks. Orient available detectors and alarms with the prevailing wind direction to provide maximum warning. Extensive alarm networks may be cost prohibitive, thus

employment of available alarms must be efficient and effective. Advance warning allows adjustments to higher MOPP levels; activation of collective protection shelters; notification/activation of emergency response forces, and dissemination of avoidance, individual protection, and decontamination procedures.

- Individual and collective protection. Equip personnel IAW emergency response plans and SOP. Determine minimum collective protection requirements and designate and establish dispersed locations, which provide the required degree of collective protection for site personnel. Designate collective protection areas and identify occupants for each. In the absence of available shelters, train personnel to utilize available cover (see Appendix J, also) for protection from chemical agents.

- Evacuation. Site evacuation, often a political decision, may occur in order to minimize danger to DOD, non-DOD, and HN civilians from hazards such as extreme environmental phenomena; fires; explosions; and NBC hazards. Advanced, well-publicized intentions of plans may preclude interference. Use CA and PSYOP to develop, produce, and disseminate information using the language of the country. Evacuation environments differ and may occur in:

    - Permissive environment. There is no apparent threat to evacuees. The HN does not oppose the orderly departure of U.S. personnel (support may be limited to medical, logistics, transportation, and security).

    - Uncertain environment. The degree of danger is uncertain. The HN may or may not be in control but cannot or will not ensure safety.

    - Hostile environment. HN or other forces are expected to oppose evacuation. Sizeable security forces may be positioned with the evacuation force or at intermediate staging bases (ISB).

- Toxic Industrial Materials. Identify toxic industrial chemical hazards (on and off site) which may pose a health hazard or accident threat (e.g., munitions, ammonia, chlorine, fertilizer, grain storage, fuel storage, landfill, pharmaceutical manufacturing, medical laboratory by-products/reagents, industrial operations).

Noncombatants. The US has responsibility for all DOD/non-DOD civilians, contract workers, HN and international civilians authorized on-site. Specific NBC defense considerations might include: continued NBC defense support; decontamination; and medical support including immunizations, treatment, and evacuation, and long term care. Commanders should seek specific policy guidance from higher headquarters to establish command responsibilities for providing NBC defense/humanitarian service to off-site civilians/refugees.

As the threat increases or actual hostilities occur, noncombatants and other selected personnel may be ordered to evacuate to a safehaven or back to CONUS. Remaining mission essential personnel might require additional training and/or cross-training to fulfill critical mission requirements. Base/base cluster NBC operations personnel should maintain a status similar to table F-2 for these mission essential noncombatants.

Table F-2. Non-Combatant NBC Status

ID NUMBER	NAME (LAST, FIRST, MI)	HOME ADDRESS	IPE ISSUED	DOD UNIT SPONSOR	TRAINING STATUS

Considerations/Responsibilities. Forced separation during an evacuation may create extreme personal hardships (mental, physical, and economical). Pursuant to Executive Order (EO) 12656, the Department of State is responsible for the protection and evacuation of American citizens abroad and for safeguarding their property. This EO directs the DOD to advise and assist in preparing and implementing evacuation plans.

- After approval, the following personnel can be ordered to depart and are eligible for evacuation assistance: American civilian employees of US government agencies (except DOD employees of military commands); US military personnel assigned to the embassy; Peace Corps volunteers; American citizens employed on contract to US government agencies (if the contract so provides); dependents of personnel assigned to the above activities; dependents of other US military personnel, including military commands. Other personnel cannot be ordered to depart but are authorized evacuation assistance.

- Priority of assistance is: (1) American citizens; (2) Alien immediate family members; (3) Third country nationals and foreign service national employees of the U.S. government; (4) Eligible non-Americans designated by Department of State (DOS) (seriously ill, lives in imminent peril); (5) Others as determined by DOS.

Physical and Operational Security (OPSEC) Awareness. Evaluate fixed site vulnerability using the vulnerability analysis process established in Appendix C. Reduce vulnerability to the site and site personnel by identifying measures for prevention, deterrence, and response. Involve military, civilian, and family in passive and active actions. Heightened NBC risks should be accompanied by increased physical and personal security and OPSEC. Increased security measures may include:

- Liaison with HN intelligence, police, and clergy for local activity.

- Increased surveillance of local hires; identify areas for heightened security and potential criminal acts.

- Increased self awareness when traveling or residing off-site.

- Increased awareness of local environmental and political activities that conflict with site mission; reduce or limit site access; evacuation of non-essential personnel (e.g., families).

- Locate, identify, and classify by probability, operational hazard, and extent of danger those off-site commercial industries, which may pose an accident or terrorist threat.

EMERGENCY OPERATIONS

Implement Emergency Response Plans. Limit personnel, equipment, and supplies exposure; protect personnel, supplies, and equipment; contain the contamination; decontaminate as required; make and implement timely risk decisions; plan for and exercise non-combatant evacuation operations (NEO). Be ready to handle casualties (psychological and physical) who will be unable to perform their duties.

Provide for Required Personnel Needs. Fixed sites may be stressed by conditions that require emergency response. Sustain individual and collective protection; prioritize decontamination; institute selective immunizations and evacuations. Be prepared to deal with large numbers of displaced civilians and noncombatants, both U.S., HN, and other.

Protect Critical and Mission Essential Operations. Defending against NBC weapons requires fixed sites to apply the NBC defense principles: contamination avoidance; protection; and restoration. Planning to defend against NBC weapons requires an analysis to determine what needs protection. Consider supporting functions of the site since they contribute to the primary mission.

Continue Mission Support. Reduce actions of sabotage (e.g., fires, bombs, tampering, disruption); restore equipment and services for reduced, full, or increased mission capability; increase physical and operational security; limit interference with emergency response teams; provide backup support to critical mission requirements and support.

APPENDIX G
TOXIC INDUSTRIAL MATERIALS

GENERAL CONSIDERATIONS

Toxic industrial material (TIM) hazards previously considered insignificant during wartime, increase greatly in significance when manufactured, stored, distributed, or transported in close proximity to fixed site operations. Deliberate or inadvertent release during military operation other than war (MOOTW) significantly increases hazards to the indigenous population and US forces. While chemical warfare agents are highly toxic and lethal in small amounts, the countries that produce them are generally known and are few in number when compared with the quantities and universal nature of TIM. TIM should be recognized for the single hazard they pose as well as the potential risks that may result from explosion, fire, and associated products derived from a single TIM or TIM in combination. Most TIM will present a vapor (inhalation) hazard. Vapor concentration at or near the point of release may be very high and may reduce the oxygen concentration below that required to support life. These TIM are generally in one of the following categories:

- **Agricultural** - Includes insecticides, herbicides, fertilizers.
- **Industrial** - Chemical and radiological materials used in manufacturing processes or for cleaning.
- **Production and Research** - Chemicals and biologicals produced or stored in a facility.
- **Radiological** - Nuclear power plants, medical facilities/laboratories.

PLANNING CONSIDERATIONS

Given the prevalence of TIM throughout the world, it must be assumed that future threats to US military force deployments will include TIM hazards. Area studies, intelligence estimates; and or economic studies may indicate potential TIM hazards in the AO. All levels of command should keep a totally open flow of information regarding the existence and status of TIM hazardous areas. Commanders must ensure the exercise of appropriate security safeguards for TIM hazard planning information, since potential belligerents could use the threat of release as well as the actual release of TIM hazards to increase local and regional tensions. Identification, location , detection, and appropriate response to potential TIM hazards must be a key part of NBC defense planning. Information of particular significance when planning a TIM hazard response includes the TIM location, hazard presented (explosive, flammable, inhalation), quantity of material involved (in combination or single), dispersion patterns based on historical prevailing wind direction, activities or populations to be evacuated/protected, protection required, established safe distances for personnel, and hazard control requirements.

In addition to other sources, the *North American Emergency Response Guidebook 1996 (NAERG96)* provides a general reference for identifying specific and generic TIM hazards, individual protection required, and emergency response when responding to the initial TIM hazard. Briefly, the NAERG96 provides a quick cross-reference index for TIM ID Numbers, Guide Numbers, and alphabetical listing of TIM hazard categories which are then incorporated into a table of initial isolation and minimum protective action distances to the 90th percentile (90% probability that hazard will not exceed these distances) (table G-1).

Develop a chart or table for known TIM hazards that may affect fixed sites. Display information (and the chart) for minimum protection of responding personnel and immediate protection of life and health of the general public. Support the chart with annotated small scale and city maps of hazard locations with prepared templates to visually depict the TIM Protective Action Zone, isolation zones, response personnel protection requirements, evacuation routes, and population holding areas.

Table G-1. Initial Isolation and Protective Action Distances (Example)

ID No./NAME OF MATERIAL	SMALL SPILLS (From a small package or small leak from a large package)			LARGE SPILLS (From a large package or from many small packages)		
	First ISOLATE in all Directions Meters (Feet)	Then PROTECT Persons Downwind during- DAY Kilometers(Miles)	NIGHT Kilometers(Miles)	First ISOLATE in all Directions Meters (Feet)	Then PROTECT Persons Downwind during- DAY Kilometers (Miles)	NIGHT Kilometers (Miles)
1005 Ammonia, anhydrous	30m(100ft)	0.2km(0.1mi)	0.3km(0.2mi)	95m (300ft)	0.3km(0.2mi)	0.8km(0.5mi)
1005 Hydrogen chloride, anhydrous	60m(200ft)	0.2km(0.1mi)	0.5km(0.3mi)	155m*(500ft)	0.5km(0.3mi)	1.8km(1.1mi)
2480 Methyl Isocyanate	125m(400ft)	0.5km(0.3mi)	2.3km(1.4mi)	305m(1000ft)	1.9km(1.2mi)	8.2km(5.1mi)
2477 Methyl isothiocyanate	60m(200ft)	0.2km(0.1mi)	0.6km(0.4mi)	185m (600ft)	0.6km(0.4mi)	2.4km(1.5mi)

Since toxic industrial vapors tend to flow into low places with little air circulation, the preferred location (balanced by mission requirements) for military facilities close to TIM hazards is at higher elevations, in open areas, upwind, and at established safe distances from the source.

Establish a hazard response guide for those TIM hazards, which could provide serious consequences if released. The hazard response guide must include the elements for the TIM hazard involved such as in Table G-2.

Of vital importance to commanders and troops, is an awareness that current military respirator canisters can provide very limited protection from TIM. Some TIM hazards can displace oxygen from the air rendering respirators ineffective; therefore, only use respirator canisters for protection while immediately exiting the hazard area.

DETERMINING PROTECTIVE ACTION ZONES

Plans that support Protective Action Zones for each hazard site and immediate evacuation from the hazard path are the best defense against the TIM hazard. As a minimum, commanders should consult with the Engineer Officer, NBC Defense Officer, Legal Officer, Medical Officer, Intelligence Officer, Provost Marshal, and Public Affairs Officer when planning Protective Action Zones. These staff officers can provide guidance for hazard isolation, entry denial, evacuation, and in-place protection. National sources may be available to provide operational and scientific expertise in the event of an actual incident.

- **Isolate Hazard Area/Entry Denial.** Isolating the hazard area establishes control and is the first step for protective actions that follow. Exclude personnel not directly involved in responding to the hazard, especially responding personnel that are not adequately protected. The Initial Isolation Zone will include upwind distances from the incident within which dangerous concentrations of a material may exist.

- **Evacuate.** When time and mission allow, evacuation is the best protective response to a TIM hazard. However, there must be enough warning and preparation time to evacuate the Protective Action Zone. Evacuate personnel nearest and those outdoors in direct view of the scene, then evacuate personnel furthest from the TIM hazard. The Protective Action Zone assumes that random wind direction changes confine the hazard vapor plume to an area within 30 degrees on either side of the predominant wind direction, resulting in a crosswind protective action distance equal to the downwind protective action distance. For practical purposes, the Protective Action Zone (e.g., the area in which people are at risk of harmful exposure) is a square, whose length and width are the same as the downwind distance as shown in figure G-1. The hazard is located at the center of the circle, which represents the Initial Isolation Zone around the hazard. Emergency action evacuation must consider that water reactive Poison Inhalation Hazards (PIH) that make their way into streams will move with the current and stretch the hazard substantial distances from the hazard point.

Table G-2. Example Hazard Response Guide (Mixed Load/Unidentified Cargo)

POTENTIAL HAZARD
FIRE OR EXPLOSION
• May explode from heat, shock, friction or contamination. • May be ignited by heat, sparks or flames. • Vapors may travel to source of ignition and flash back. • Containers may explode when heated.
HEALTH
• Inhalation, ingestion or contact with substance may cause severe injury, infection, diseases or death. • High concentration of gas may cause asphyxiation without warning. • Contact may cause burns to skin and eyes. • Runoff from fire control may cause pollution.
PUBLIC SAFETY
PROTECTIVE CLOTHING
• Wear positive pressure self-contained breathing apparatus (SCBA). • Structural firefighters' protective clothing will only provide limited protection.
EVACUATION
Fire • If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions.
EMERGENCY RESPONSE
FIRE **CAUTION: Material may react with extinguishing agent.** **Small Fires** • Dry chemical, CO_2, water spray or regular foam. **Large Fires** • Water spray, fog or regular foam. • Move containers from fire area if you can do it without risk. **Fire Involving Tanks** • Cool containers with flooding quantities of water until well after fire is out. • Do not get water inside containers. • Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank. • ALWAYS stay away from the ends of tanks.
SPILL OR LEAK
• Do not touch or walk through spilled material. • Eliminate all ignition sources (no smoking, flares, sparks or flames in the immediate area). • All equipment used when handling the product must be grounded. • Keep combustibles (wood, paper, oil, etc.) away from spilled material. • Prevent entry into waterways, sewers, basements or confined areas.
FIRST AID
• Move victim to fresh air. • Call emergency medical care. • Apply artificial respiration if victim is not breathing. • Do not use mouth-to-mouth method if victim ingested or inhaled the substances; Use other approved respiration devices equipped with a one-way valve. • Remove and isolate contaminated clothing. • Administer oxygen if breathing is difficult. • Shower and wash with soap and water. • Effects of exposure (inhalation, ingestion or skin contact) may be delayed. • Ensure medical personnel are aware of the material(s) involved, and take precautions to protect themselves.

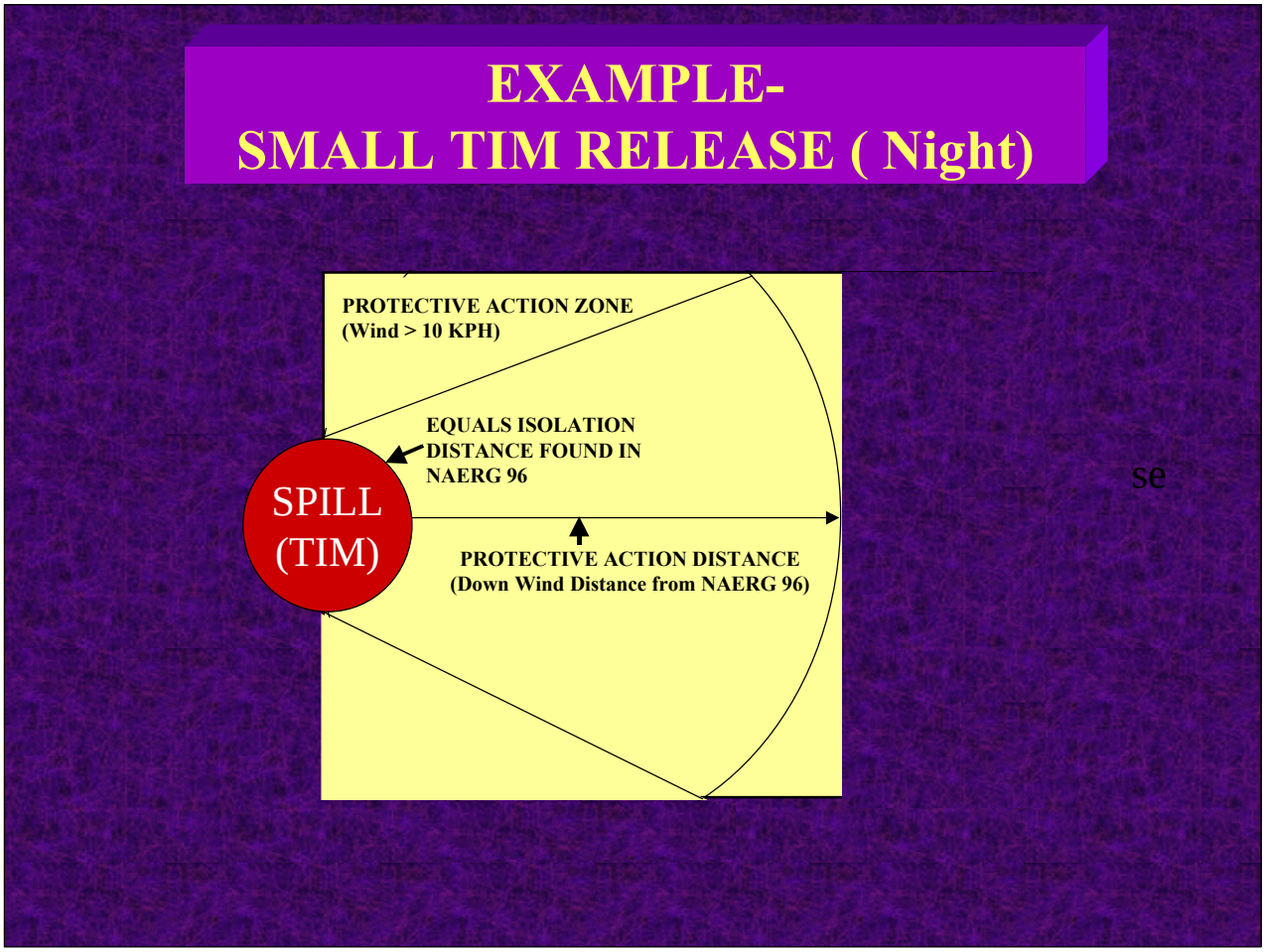


Figure G-1. Protective Action Zone

When evacuating the hazard area, individuals wear clothing that prevents deposition of liquid on and minimizes injury to exposed skin. NBC protective clothing may be used.

Do not permit evacuees to congregate at established safe distances. Evacuation to established safe distances does not guarantee complete safety for evacuated personnel. When possible, move evacuated personnel to a designated location by a specific route, and to a distance where additional movement is not required following a radical wind shift.

- **In-Place Protection**. Use in-place protection (Table J-2) when evacuation may cause greater risk than remaining in place or when successful evacuation cannot be conducted. In-place protection may not be the option of choice if the TIM vapors are flammable; if the hazard is persistent; or if buildings cannot be closed tightly. Although vehicles are not as effective as buildings, vehicles can offer some protection for a short period when windows are closed and the ventilating system is shut off. Warn persons that are protected-in-place to stay clear of windows due to the danger from glass and projectiles in the case of fire and/or explosion. Maintain communications with in-place protected personnel to advise them of changing conditions. Communications is a psychological lifeline for personnel cutoff from freedom of movement and information.

VULNERABILITY MITIGATION

Since TIM incidents differ, each will have special problems and considerations. During planning, attempt to secure pertinent information involving production, storage facilities, distribution, and transportation of TIM. As a minimum, obtain the type, quantity, and specific risk from fire, explosion, toxicity, corrosive effects, and/or persistency of gas. Sources for this information include appropriate scientific, civilian industrial, and chemical warfare treaty experts; safety reports and data sheets on the facility; international code markings on storage tanks; and local civilian authorities who may have emergency response procedures/resources.

A thorough vulnerability analysis provides an initial estimate of the NBC threat and is the first step toward mitigating the operational effects of damage or destruction of a TIM facility. Determining the TIM hazard/threat in an area of operations is a primary responsibility of the medical staff/supporting preventive medicine personnel, supported by the chemical and civil affairs staffs. Prior to entry into the area, area assessment teams provide information involving TIM hazard production and storage facilities and suspected hazard areas. These teams can also provide the threat to a given facility and input about previous industrial operations at the facility.

TIM PRECAUTIONS

When no release has occurred, establish a minimum safety exclusion zone of 1-kilometer radius around the TIM facility. Mission requirements will determine entrance to this exclusion area. Avoid establishing encampments of mobile units within 5-km and permanent encampments within 10-km of the TIM facility. Deviations from these safety exclusion areas may be permitted after a detailed survey and assessment of the TIM facility.

If a TIM release occurs, evacuate beyond a 5-km safety exclusion zone until a chemical hazard prediction can be produced in accordance with Allied Tactical Publication 45. When mission requirements dictate entering the exclusion zone, personnel must wear, at minimum: Positive Pressure (Pressure Demand), self-contained breathing apparatus (MSHA/NIOSH approved); fully-encapsulated chemical resistant suit; chemical resistant inner gloves; chemical resistant outer gloves; two-way radio communications and other recommended safety equipment as appropriate. **NOTE: MOPP does not equal fully-encapsulated chemical resistant suit.** Units will not encamp within 10-km of the TIM release. Reduce safety exclusion areas only after a detailed survey and assessment of the extent of the probable hazard area.

When friendly units are required to operate in an area where a potential TIM facility exists, NBC defense planning should includes these actions:

- Coordinate with HN emergency response teams.
    - US forces have no jurisdiction outside DOD installations except for the continuing obligation to safeguard US lives and property.
    - Integrate Department of State (DOS) into the decision-making process in OCONUS operations.
    - Teams may be from the HN government, HN armed forces, or from the industrial facility involved.
    - Communicating sensitive tasks and tasks requiring immediate response may hinder task accomplishment in non-English-speaking countries. Arrange for interpreters/translators.
- Identify the TIM, extent of contamination present, extent of possible contamination given a future accidental or intentional release.

- Apply a matrix to develop the minimum safe distance to the hazard.

- Provide individual and group total dose dosimetry and radiological dose rate measurement for low level radiation (LLR) hazard to at least .001 cGy/hour.

- Establish a LLR turn back dose rate for survey teams.

- Determine protection requirements for radiological hazards.

    - Determine whether standard issue NBC defense equipment (e.g., protective mask, boots, gloves, protective overgarment) will protect against the potential harmful effects of the identified hazard.

    - Develop a requirement for, procure, and train in protective equipment required to safely respond to the potential release.

    - Know the potential for serious long-term medical effects and legal liabilities involved with exposure to low level radiation hazards.

    - When military necessity dictates operations be conducted in a confirmed radiological hazard area, initiate dose control measures in accordance with table G-3. (ACE Directive No. 80-63, *ACE Policy for Defensive Measures Against Low Level Radiological Hazards during Military Operations*).

- Coordinate with higher headquarters and HN to identify support availability.

    - Identify chemical accident/incident response and assistance (CAIRA) teams (e.g., Technical Escort units or similar civilian agencies).

    - Anticipate scenarios that require coordinated responses.

- Develop a chemical accident/incident response plan.

    - Determine requirements for hardening or in-place-protection of sites or activities that must provide continuous mission support.

NBCWRS ROTA PROCEDURES

If the position of the TIM release is known, report the event using the NBC-1 format, identifying the message as an NBC-1 ROTA (Release Other Than Attack).

- The Lines BRAVO, CHARLIE, DELTA, ECHO, FOXTROT, GOLF, HOTEL, INDIA, KILO, YANKEE, ZULU ALPHA, and GENTEX within the report will contain the information currently described for traditional NBC reports.

- Line GOLF will include the ROTA source. Line HOTEL will indicate TIM or the specific hazardous compound if known. Line INDIA will indicate a description of the quantity of materiel released if known.

216 **Table G-3. RADIATION OPERATIONAL EXPOSURE GUIDANCE**

TOTAL CUMULATIVE DOSE (cGy) [1, 2, 3] (See Notes)	RADIATION EXPOSURE STATE (RES) CATEGORY	RISK [4, 5] (See Notes)	ACTIONS
<0.05 cGy	0	NO RISK	None
0.05 to 0.5 cGy	1A (See NOTE 1)	NORMAL RISK	Record Individual Dose Readings Initiate Periodic Monitoring
0.5 to 5 cGy	1B (See NOTE 1)	MINIMAL RISK	Record Individual Dose Readings Continue Monitoring Initiate RAD Survey Prioritize Tasks Establish Dose Control Measures as Part of Operations
5 to 10 cGy	1C (See NOTE 1)	LIMITED RISK	Record Individual Dose Readings Continue Monitoring/Update Survey Continue Dose Control Measures Execute Priority Tasks Only[6] **(See Notes)**
10 to 25 cGy[7] **(See Notes)**	1D (See NOTE 1)	INCREASED RISK	Record Individual Dose Readings Continue Monitoring/Update Survey Continue Dose Control Measures Execute Critical Tasks Only[6] **(See Notes)**
25 to 70 cGy[8] **(See Notes)**	1E (See NOTE 1)	SIGNIFICANT RISK	Record Individual Dose Readings Continue Monitoring/Update Survey Continue Dose Control Measures Execute Critical Tasks Only[6] **(See Notes)**

NOTES:

1. Dose is uniform to the entire body due to whole body irradiation. This table does not consider the intake of radioactive material. This is assumed due to employment of effective respiratory protection and other measures.

2. Keep all doses as low as reasonably achievable (ALARA). This reduces individual soldier risk and retains maximum operational flexibility for future employment.

3. The use of the measurement Milli Sieverts (mSv) is preferred. Normally the military only has the capability to measure Centigray (cGy). Use cGy if measurements in mSv is not possible. For whole body Gamma radiation: 1 cGy = 10 mSv.

4. Risk is long term health consequences, primarily induction of cancer. Total lifetime risk is assumed to be four to seven percent per 100 cGy (= 1000 mSv). This is in addition to the 20 - 25% incidence of fatal cancer among the general population. Additional health risks that may occur are teratogenesis and mutagenesis and their associated psychological and social consequences.

5. It must be noted that higher radiation dose rates produce proportionally more health risk than the same dose given over a longer period.

6. Examples of priority tasks are missions to avert danger to persons or to prevent damage from spreading. Examples of critical tasks are missions to save human life.

7. During peacetime, do not exceed this dose except to save human lives.

8. RES category 1E covers a wide range of dose and its lower level (25 cGy = 250 mSv) is the peacetime maximum operational dose in many NATO nations. This category is normally only applicable in wartime. Intentional exposure to doses in this category (25 - 70 cGy = 250 - 700 mSv) requires additional justification.

NBC 1 (Release Other Than Attack)			
LINE	**NUCLEAR**	**CHEMICAL**	**BIOLOGICAL**
B (Position of observer.		LB200300	
C (Direction of attack from observer.)			
D (Date-time group for start of attack.)		191440Z	
E (Date time group for end of attack.)		Unknown	
F (Location of area attacked.)		LB206300 Act	
G (Kind of attack.)		Ice Plant	
H (Type of agent/height of burst..)		Ammonia	
I (Number of munitions or aircraft.)		125 lb	
K (Description of terrain and vegetation.)		Urban	
Y (Downwind direction of hazard and windspeed.)		175 deg Grid	
ZA (Significant weather phenomena.)		None	
NOTE: Line items B, D, H, and either C or F should always be reported; other line items may be used if the information is known.			

If the observer does not know the position of the TIM release, report IAW ATP 45(A) using the NBC-4 format as described for an off-target attack. Also include Lines GOLF, HOTEL, and INDIA.

NBC 4 REPORT (RECONNAISSANCE, MONITORING, AND SURVEY RESULTS)		
LINE	**NUCLEAR**	**CHEMICAL**
G (Kind of attack.)		Explosion
H (Type of agent/height of burst..)		Ammonia
I (Number of munitions or aircraft.)		125 lbs
Q (Location of sampling and type of sample)		LB206300 Act
R (Dose rate)		NA
S (Date-time group of reading)		191538Z

NOTES:

1. Line items H, Q, R, and S may be repeated as often as necessary.
2. Radiation dose rates are measured in the open, with instrument 1-M above the ground.
3. In line R, descriptive words such as “initial,” “peak,” “increasing,” “decreasing,” “special,” “series,” “verification,” or “summary” may be added.
4. If readings are taken inside a vehicle or shelter, also give the correlation factor.

Use the normal NBC-3 message format for the hazard prediction. However, identify the message as an NBC-3 ROTA with Line HOTEL indicating TIM or the specific hazardous material, if known.

NBC 3 REPORT (IMMEDIATE WARNING OF EXPECTED CONTAMINATION)		
LINE	**NUCLEAR**	**CHEMICAL**
A (Strike serial number.)		Asg by NBCC
D (Date-time group for start of attack.)		191440Z
F (Location of area attacked.)		LB206300 Act
H (Type of agent/height of burst.)		Ammonia
N (NA)		NA
PA (Predicted hazard area.)		LB206300
		LB208302
		LB206302
		LB208300
		0175 Deg/015 kmph
Y (Downwind direction of hazard and windspeed.)		NA
Z (Effective wind dir and ws. Zone I nuclear, cloud radius.)		None
ZA (Significant weather phenomena)		NA
ZI (Effective wind dir and ws. Zone II nuclear, cloud radius.)		

NOTES:

1. If the effective windspeed is less than 8 kmph, line Z of the NBC 3 (Nuclear) consists of three digits for the radius of Zone 1.
2. If the windspeed is less than 10 kmph, line PA of the NBC 3 (Chemical) is 010 which is the radius of the hazard area..
3. When ZI is used, line Z is not used.

Dispatch properly equipped NBC Defense teams to verify the presence or absence of industrial NBC material, the nature of any industrial NBC hazard, or the extent of a suspected industrial NBC hazard.

Based on hazard predictions and NBC defense team recon results, alert and coordinate with all affected units. Additional actions include:

- Implement the TIM reconnaissance plan and assign units to prepare and execute the reconnaissance missions.

- Coordinate with theater medical elements (e.g., preventive medicine team) for follow-on industrial hygiene assessments, as dictated by mission requirements.

- Coordinate with in-theater Technical Escort Unit elements for follow-on technical support, if appropriate.

- Coordinate with Engineer elements, if the facility in question was damaged or destroyed, or assessments indicate it is abandoned.

- Coordinate with decontamination elements to prepare for possible decontamination of personnel and equipment contaminated with TIM.

- Coordinate for delivery of samples collected during TIM reconnaissance operations to the in-theater supporting medical laboratory

- Avoid hazard areas as long as possible. When conducting reconnaissance or rescue operations near or within the hazard, equip ground survey teams with respiratory protection (SCBA) and skin protection certified for the TIM. Use aerial, visual reconnaissance to help collect command and control information to assist with incident management.

- Survey IAW established procedures to determine the limits of the hazard. Mark hazard areas in accordance with STANAG 2002, *Warning Signs for the Marking of Contaminated or Dangerous Land Areas, Complete Equipments, Supplies and Stores.* Use appropriate hazard markers (e.g., annotate the identified TIM on the chemical or radiological marker).

- Identify the hazard using suitable detection equipment. The mass spectrometer is the only military equipment that is suitable for TIM identification and readily available in some military units. Suitable radiation detection equipment is readily available to most military organizations.

- Use commercial detectors, such as Draeger tubes, which can provide confirmation of individual TIM. However, chemical reactions and combustion by-products produce toxic products that are not identified by these detectors.

RISK MANAGEMENT SUMMARY

- **Exposures exceeding the permissible exposure limits and published exposure levels Immediately Dangerous to Life and Health (IDLH).** Mandate personal protective equipment commensurate with the TIM hazards, to include specific individual and collective protective equipment.

- **Potential skin absorption and irritation sources.** Evaluate TIM hazards for water and air reactivity; explosive, combustible or other mixture hazards; and toxicity hazards. Mark and template potential hazard zones and plan and institute protective measures.

- **Potential eye irritation sources.** Provide individual protective equipment or other protective measures to keep individual exposure within prescribed safe limits.

- **Oxygen deficiency.** Evaluate hazards that might cause decreases in oxygen level and install warning devices that alert to oxygen deficient levels.

- **Explosion sensitivity and flammability ranges.** Determine hazards identified as explosive sensitive and document flammability thresholds of each.

APPENDIX H
FIXED SITE DECONTAMINATION

OVERVIEW

This appendix begins with a series of decision/logic charts (see Figure H-1) for assisting commanders with decontamination decisions. Excluding some different techniques for specialized equipment, personnel and equipment decontamination procedures (see Figures H-2 and H-3) referred to in these charts are essentially the same throughout the Services and are addressed in specific service doctrinal manuals.

However, the remainder of the appendix focuses on facilities and terrain decon techniques (see Figures H-4 and H-5) since very little detailed tactics, techniques, and procedures exist in any single reference.

DECONTAMINATION DECISION LOGIC

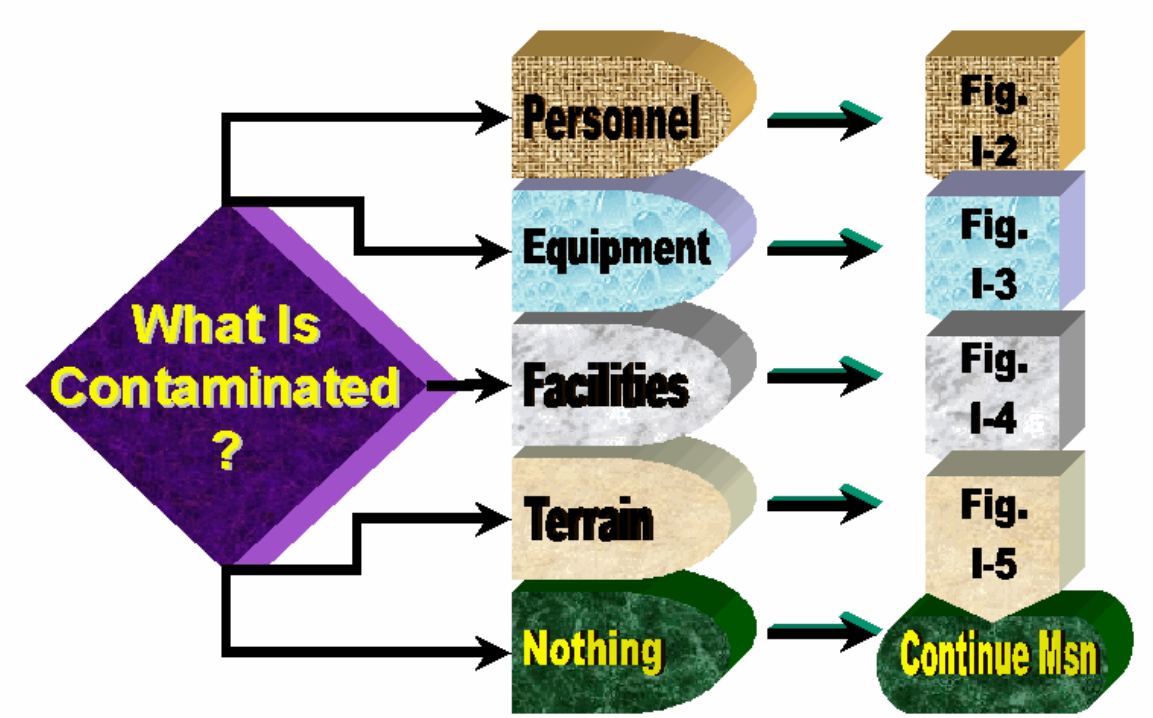


Figure H-1. Decon Decisions

PERSONNEL CONTAMINATION

Contaminated personnel should automatically perform immediate decontamination as soon as possible after the attack. Beyond immediate decontamination the commander must make decisions (see Figure H-2) based on answers to questions that will affect his mission. "Can the mission be accomplished in MOPP?" is a question of immediate importance and drives subsequent decisions. The commander's goal is to accomplish the mission with minimum degradation from MOPP balanced with the requirement to protect the force personnel from the NBC hazard. If time and resources are insufficient for a thorough decon, the commander considers the same requirements for operational decontamination. Remember that operational decontamination is not the preferred end state because it incurs risk and degradation until thorough decon or weathering (normally for extended periods) eliminates the risk.

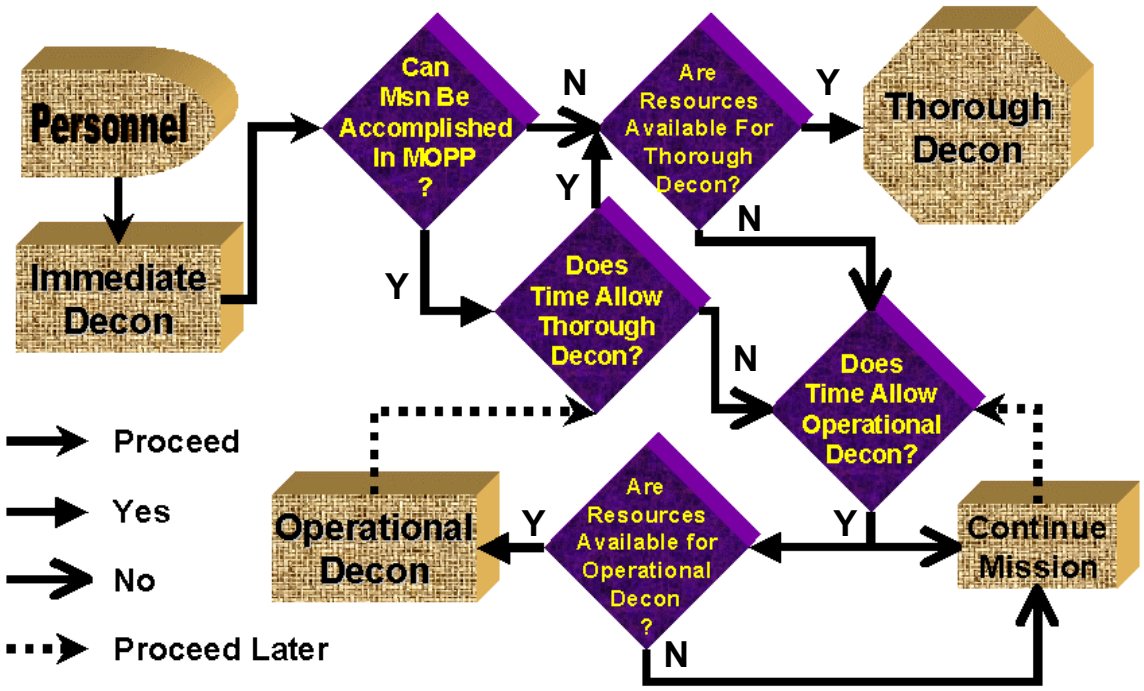


Figure H-2. Personnel Decisions

Equipment Contamination

After decontaminating themselves, personnel should perform immediate decontamination on contaminated individual equipment. As personnel perform immediate decontamination, the commander determines if the remaining contamination will cause unacceptable mission-performance degradation. If acceptable, the commander continues the mission assuming an element of risk requiring frequent reassessment.

When risks are unacceptable, the commander considers (see Figure H-3) operational or thorough decon. The staff's recommendation is based on available time and resources. Ideally, if both are available, conduct thorough decon. If time and resources are limited, consider operational decon to provide temporary relief from MOPP and reduce contamination on equipment. If time or resources don't permit operational decon, continue the mission with periodic reviews of risk and resources.

Facility Contamination

If facilities are contaminated (see Figure H-4), the first actions are: marking, reporting, and warning of the contamination. This allows the commander to determine the extent of contamination in mission essential facilities. In partially contaminated facilities, the commander determines if the contaminated area is mission essential or creating a vapor hazard. If the answer is "No" to both questions, the commander continues the mission, and the area is, if necessary, remediated post-conflict.

Contamination hazards that may cause mission failure or pose unacceptable risk require the commander and staff to determine if mission functions can move to another facility within the base/base cluster. If the function(s) can't be moved within the base/base cluster, the commander and staff consider relocating the function(s) to another redundant facility in theater; if not a viable option, consider operational decon. Remember, as with contaminated terrain, contaminated facilities may require post-conflict remediation. If decontamination is the only viable option see page H-10 for further assistance.

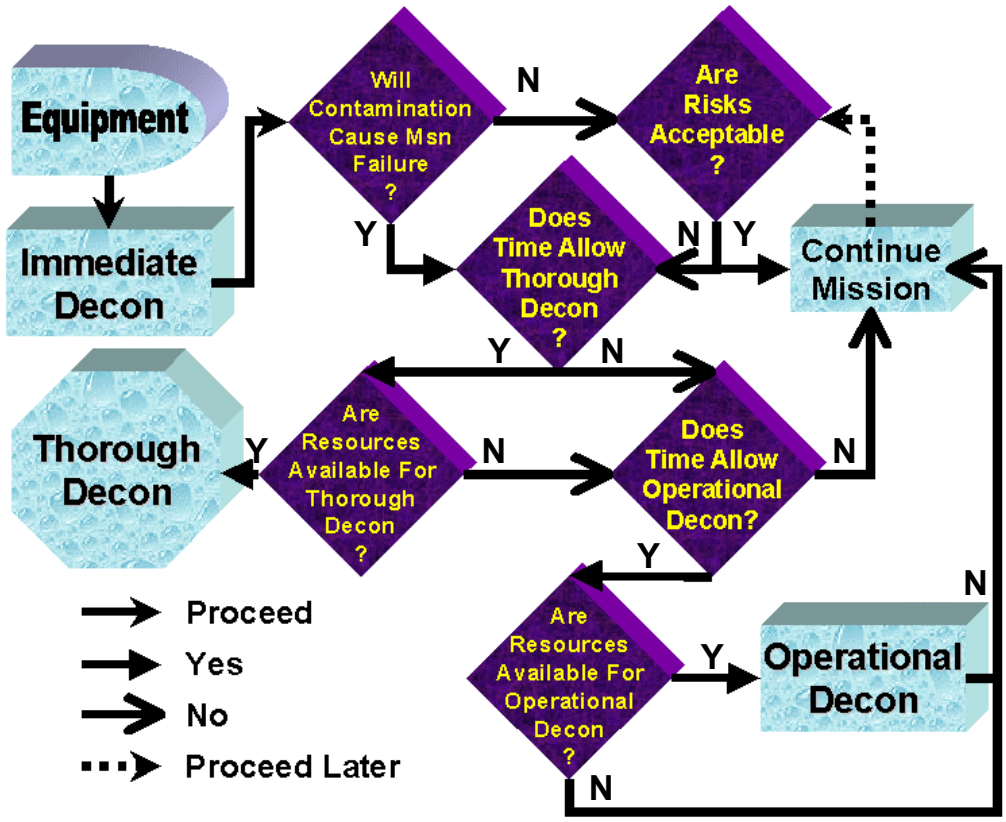


Figure H-3. Equipment Decisions

65

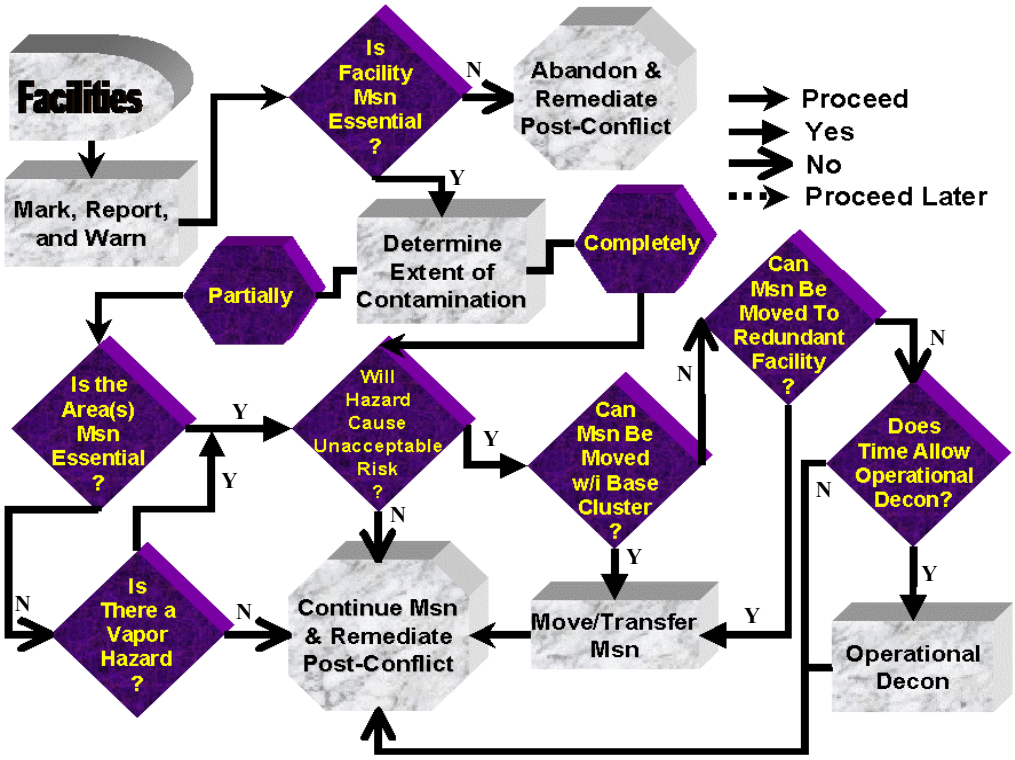


Figure H-4. Facility Decisions

Terrain Contamination

Contaminated terrain (see Figure H-5) poses two problems for the commander: a hazardous obstacle to maneuver/operations and a downwind hazard. Units encountering contamination, mark and report the area so other units can receive warning. While the area will likely require post-conflict environmental remediation, continue the mission if it is neither an obstacle nor downwind hazard.

As with any obstacle, the commander can choose to breach or not use the area in the vicinity of the NBC hazard. Regardless, commanders ensure personnel are protected. Breaching operations are hasty or deliberate based on mission, time available, and resources. In either case, personnel and equipment are checked afterward for contamination and will likely require decon.

Contaminated terrain may pose a hazard downwind. Avoiding the hazard by relocating may not support mission requirements, and prolonged operations in increased protection (MOPP) may also be unacceptable. If so, the commander may have to cover, remove, or decon the hazard to reduce mission risks. As with breaching, work crews and equipment will likely require decontamination.

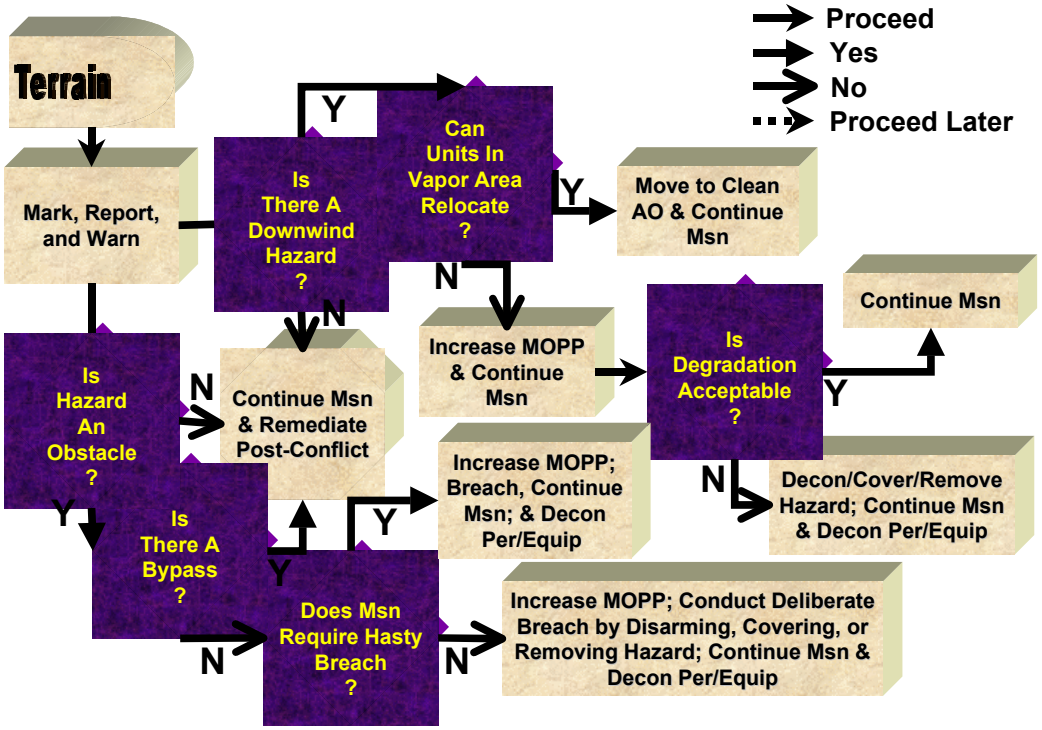


Figure H-5. Terrain Decisions

FACILITY DECON

Decontamination of fixed sites should be considered only when the loss of the facility will adversely affect mission accomplishment. Facilities can be: heated, flushed, disinfected, and neutralized (see Table H-1) to remove, or destroy the contamination. Regardless of the technique chosen, decontamination should be limited to those facilities and portions of those facilities that are absolutely mission essential, without which mission objectives are endangered. All remaining facilities/portions of facilities (appropriately marked) will be decontaminated as necessary during post-conflict operations. There may be advantages to decontaminating some runways and

taxiways. Cleaning these surfaces reduces the amount of contamination transferred to aircraft and by aircraft to surrounding personnel, equipment and structures. Such action is very resource intensive but should be considered if the facility is vital enough to warrant continued operations after a NBC attack.

Facility decontamination should be reduced to the minimum possible effort. "If it isn't nailed down remove it", is the best possible advice. Decontamination of ceilings, walls, "nailed down items", built in surfaces and floors must be accomplished from the ceiling down.

Table H-2 provides guidance but does not include everything you may find in a facility that requires decontamination. The basic rule is: **If you absolutely must have it to ensure mission accomplishment, and you can t replace it, then decontaminate it.** However, commanders and staffs must be ruthless in deciding what can and what can't be replaced and consequently what must be decontaminated and what must be removed.

Table H-1. Facilities Decontamination

DECON OF:	POSSIBLE ACTIONS
Nuclear Contamination	**Flushing:** Can be effective for removing loose radioactive contamination. However, a condition known as rainout may leave a film on some surfaces that resists flushing. Flushing, combined with scrubbing the contaminated surface should remove all contamination. **NOTE:** Control of wastewater is of vital importance, as flushing removes contamination but doesn't neutralize it. See reference listing below for standard and nonstandard decontaminants. **NOTE:** Not all decontaminants are suitable for interior decontamination. Users must take into account the type of surface that is being decontaminated.
Biological Contamination	**Heat:** Apply large amounts of heat; both dry heat and steam may be used to destroy/neutralize biological contamination. Heat may be combined with the application of UV light from commercially available ultraviolet lamps. **Do not expose personnel to ultraviolet lamps while they are being used.** **NOTE:** When using heat, the user must take into account the combustibility of the surfaces being heated. **Disinfect: T**ake care to ensure the disinfectant won't destroy the facility that is being decontaminated. Use items such as, but not limited to, those shown in the decontaminants reference for standard and nonstandard decontaminants. **NOTE: Some biological agents are heat stable, therefore heat will not work as a decontaminant. Check with medical staff personnel to determine which biological agents may be destroyed/neutralized using heat.** **NOTE:** Not all decontaminants are suitable for interior decontamination and not all decontaminants are suitable for biological decontamination. **Flushing:** Can be very effective for **removing** biological agents, to include diluting toxins. **Flushing does not neutralize biological agents**, but transfers the problem from your immediate area to a contained area (sump) where they may be neutralized. **NOTE:** Rough surfaces must be scrubbed after the disinfectant has been applied or flushing has occurred to ensure contamination doesn't lodge or embed itself in the contaminated surface. If you are unsure whether the surface is smooth or rough - scrub the surface after the disinfectant has been applied and or flushing has occurred.
Chemical Contamination	**Heat:** If air filtration systems are available, reduce the agent to a vapor hazard with heat (dry) and allow the filtration system to absorb or exhaust the hazard. Remove the filter and dispose of appropriately. **Flushing:** Is not effective for removing some types of chemical agents, especially thickened agents. **Flushing does not neutralize chemical agents**, but transfers the problem from your immediate area to a contained area (sump) where they may be neutralized. **Neutralize:** See decontaminant reference list, below for standard and nonstandard decontaminants. **NOTE:** Not all decontaminants are suitable for interior decontamination, and not all decontaminants are suitable for chemical decontamination.
Monitoring Operations	**Monitor surfaces immediately after decontamination operations and before use. Periodically monitor surfaces for residual/missed/resurfacing contamination.**

Table H- 2. Removable Items - Facilities Decontamination

Light fixtures	**chandeliers and other ornate fixtures**
Wall coverings	**pictures, posters, charts, drapes/curtains, paintings**
Furniture	**chairs, tables, desks, couches, book cases, work benches**
Appliances	**telephones, computers, fax machines, copy machines, coffee pots**
Floor coverings	**rugs, linoleum, all loose/movable coverings**

Radiological Decontamination. Radioactive contaminants cannot be made safe by chemical action. They must be removed or shielded if it is impracticable to wait for natural decay. Therefore, radiological decontamination is the process of reducing the radiation hazard to an acceptable level by removal and disposal of the contamination or by placing shielding over the contamination. Table H-3 describes various types of decontaminants that have proven effective in the removal of radiological contamination. Table H-4 discusses different pieces of equipment that may be used to remove contamination from facilities, and Table H-5 discusses types of surfaces and decontaminants that may be used on them. These tables are not all-inclusive, but should be used with caution and safety measures discussed in Appendix G, Toxic Industrial Materials.

Table H-3. Radiological Contamination Removal Methods.

Decontaminant	Type	Remarks
Soapless detergent, soap, wetting agent.	Detergent	Practicable for field use
Gasoline, kerosene	Solvent	Practicable for field use
Water, Steam	Solvent	Practicable for field use
Potassium hydroxide, sodium hydroxide, trisodium phosphate, sodium orthosilicate	Solvent	Practicable for field use
Acetone, alcohol, ether, paint remover	Solvent	Practicable four small-scale operations only
Citrates, citric acid, sodium versenates, polyphosphates	Complexing agent	Practicable for small-scale operations only
Aqua regia[1], hydrochloric acid[1], nitric acid[1]	Corroding agent	Practicable for small-scale operations only

[1] **To be handled by experienced personnel only.**

Table H-4. Radiological Decontamination Equipment

Items	Use
Power-driven decon apparatus (PDDA)	Capable of providing 400-gallon of heated water. Large scale hosing and spraying of vital areas, buildings, vehicles, and machinery.
Broom	Brushing dust from personnel, clothing, equipment and surfaces.
Brush	Scrubbing and brushing (same as for broom).
Shovel	Removal, burial, or other disposal of contaminated objects and materials.
Fire or water hose	Hosing and scrubbing operations; also for use with bulldozer or road grader in holding down dust.
Bulldozer	Large-scale removal, burial, or other disposal of contaminated objects.
Long-handled scraper.	Scraping paint.
Steam jenny	Cleaning complicated machinery and greasy or hard dirt from surfaces.
Water-carrying or moving equipment	Moving water.
Containers	Waste movement and control.

135 **Table H-5. Radiological Decontamination -Fixed Site Facilities**

Surface	Method	Advantages	Disadvantages
Paint	Water	Most practical method for gross decontamination.	Runoff must be controlled. Protection needed from contaminated spray.
	Detergent	Most commonly available re-agent. Removes grease films.	Mild action. Waste must be controlled.
	Complexing agents	Complexes contaminants, holding them in solution.	Requires application from 5 to 30 minutes for effectiveness. Has little penetrating power; hence, of small value on weathered surfaces. Single agent not effective for all contaminants. Not always available. Waste must be controlled.
	Scrubbing with water and detergent.	Greater surface action than water and detergent alone.	Personnel in close contact with contaminants. Not always available. Waste must be controlled.
	Organic solvents(gasoline, kerosene, turpentine, acetone, ether, commercial paint removers)	Quick dissolving action.	Toxic and flammable. Requires good ventilation and fire precautions. Waste must be controlled.
	Caustics	Minimum contact required with contaminated surface. Contamination reduced almost 100 percent.	Applicable only on horizontal surfaces. Personnel hazard. Not to be used on aluminum or magnesium. Waste must be controlled.
	Abrasion (wet)	Complete removal of surface and contamination. Feasible for large scale operations.	Too harsh for many surfaces.
	Strippable coating	Ease of use.	Must be applied before contamination occurs. Control of powder residue necessary.
Glass	Detergent	Readily available.	Efficiency depends on nature of contaminant.
	Complexing agents Oxidizing acids and agents	Complexes contaminants.	Single agent not effective for all contaminants. Not always available. Single agent not universally applicable. Personnel hazard.
Metal	Water	Most practical method of gross decontamination.	Same as for painted surfaces.
	Detergent	Removes oil or grease films.	Same as for painted surfaces.
	Complexing agents	Complexes contaminants, holding them in solution.	Same as for painted surfaces.
	Organic solvents	Stripping of grease.	Same as for painted surfaces.
	Brushing, sweeping, wiping	Removes contaminated dust when water isn't readily available.	Contaminated dust hazard to personnel.
	Inorganic acids	Fast, complete decontamination.	Removes part of surface. Good ventilation required; acid fumes toxic to personnel.
	Acid mixtures	Action of weak acid reduces contamination on unweathered surfaces.	Same as for organic acids.
	Oxidizing acids and agents	Decontamination relatively complete for inert metals.	Same as for inorganic acids.
	Ultrasonics	Removes adhering dust contaminants.	Requires specialized equipment.
Concrete and Brick	Abrasion (vacuum blasting	Direct and complete removal of contaminated dust.	Contamination of equipment.
	Vacuum cleaning	Direct removal of contaminated dust.	Same as for vacuum blasting on concrete.
	Water	For large concrete surfaces contaminated with dust and dirt.	Drives some of the contaminant into the surface. Waste must be controlled.
Wood	Planing	Complete removal of contamination. Minimum dust hazard.	May impair use.

136

Biological Decontamination. Many of the same decontaminants used for radiological and chemical decontamination are used for biological decontamination. Table H-6 provides a listing of standard and nonstandard decontaminants as well as how they should be applied, their limitations, in reference to biological decontamination, and any pertinent remarks. Table H-7 provides "how to" guidance in the decontamination of biological agents from fixed site facilities.

Table H-6. Chemical Decontaminants for Biological Agents

Decontaminant	Application	Limitations	Remarks
Decontaminating agent, biological, BPL (betapropiol-acetone).	Used as a vapor or gas. Adequate circulation must be provided during dissemination. 1gal BPL/25,000ft^3 of space; for rooms with unusual amounts of absorptive surfaces (furnished dayrooms or living quarters), 1gal/16,000ft^3. Recommended conditions are 70^{o}F, relative humidity ≥70%, and 2hrs contact time. Can be used down to 40^o F, but must still have a high humidity, and time must be extended. Aerate 4 to 24hrs after decon.	**Vapors are highly toxic.** Do not store for more than 3 months unless refrigerated. Do not allow liquid BPL to collect on surfaces during operations as some materials are adversely affected. **Protective masks are required for personnel exposed to BPL vapors.** If exposure period is extensive, impermeable clothing plus a self-contained breathing apparatus is required.	Forms liquid film if excess BPL is used or if sprayer is too close to surfaces. Standard insecticide sprayers recommended. Remove all BPL before area is reoccupied.
Formaldehyde solution (formalin). Formalin-methanol mixture (5 parts formalin and 3 parts methanol).	Applied as vapor from standard insecticide sprayers or vaporized by heat or bubbling steam through pan of material (contact time, 16hrs). 1qt of undiluted formalin or 4/5qt of formalin-methanol mixture/1,000ft^3 above 70^{o}F. With a relative humidity of 85%. The minimum effective relative humidity is 70%. The minimum effective temperature is 60^{o}F, at which temperature the exposure time should be increased to 24hrs. Aerate after decon until odor is no longer objectionable.	**Vapors are highly toxic.** Vapors of formalin are not flammable; open flame should not be used for vaporizing when methanol has been added to formalin. When steam is used, source of steam should be outside area being deconned. Will not penetrate cloth and similar fabrics as effectively as ETO-fluorinated hydrocarbon mixture. May damage delicate instruments. Dampness may curl and ripple paper. Vapor polymerizes and deposits white powder on horizontal surfaces; this powder may be washed off with hot water. **Handlers are required to wear a self-contained breathing apparatus, rubber gloves, and protective clothing.**	Once vaporization has started, personnel should not enter area until process is completed. Take care to prevent leakage of solution during storage.
Ethylene oxide-fluorinated hydrocarbon mixture (a mixture of 12 percent ethylene oxide and 88 percent fluorinated hydrocarbons).	Use to decon clothing and small equipment. Use one 12-ounce dispenser for one set of clothing or batch of equipment in a plastic (polyethylene) bag about 2½ by 6 feet in size. Expose for 6-8hrs at 70^o-80^{o}F, halve this time for each 18-degree increase above 80^{o}F. Aerate 6-8hrs. Use to decon vehicles under airtight tarpaulin. Use four 12-ounce dispensers for each 2.83m^3(100ft^3). Expose for 6-8hrs at 75^{o}F (24^{o}C).	Do not use below 60^{o}F. Do not allow liquid as it emerges from dispenser to collect on surfaces. **FLAMMABLE: Forms an explosive mixture with air.**	Vapor is noncorrosive. Aerate rubber and plastic items to be worn next to the skin for at least 18hrs.
Decontaminating agent, STB (super tropical bleach).	For horizontal surfaces, apply slurry of 7 parts STB to 93 parts water. Applied preferably from a PDDA. Avg coverage = 1gal/8yd^2 (7m^2) for porous surfaces such as concrete and 1/2gal/m^2 for closely packed surfaces.	Corrosive to metals. **Do not inhale or allow to contact skin. Wear protective mask or other respiratory protective device when preparing slurry.**	In ordinary storage, loss of available chlorine is < 1%/mon. When free chlorine falls below 10%, bleach should be salvaged. As available free chlorine is lost, increase STB content in slurry. Stored in unheated warehouse isolated from combustibles and metals subject to corrosion. Packaged in 8gal drums.

Decontaminant	Application	Limitations	Remarks
Decontaminating agent, DS2	Applied to surfaces with brushes, brooms, or swabs, or sprayed from ABC-M13 portable apparatus. Surfaces should be flushed with water after 30min.	FLAMMABLE. Do not allow contact with skin; remove from skin and metals. Ineffective against bacterial spores. Corrosive to some metals.	Packaged ready to use in 5gal drums.
Calcium hypochlorite, HTH	Use a slurry of 3 parts HTH and 97 parts water for horizontal surfaces. Approximate coverage is 1gal/8yd^2 (7m^2).	Highly corrosive to metals. Loses chlorine content rapidly. Do not inhale or allow contact with skin and eyes. Wear protective mask or other respiratory protective device and rubber gloves when preparing slurry.	Packaged in 5lb cans and 100lb drums. Contains about 70% available chlorine when packaged.
Sodium hypochlorite (household bleach).	Applied (undiluted) with brooms, brushes, or swabs. Can be sprayed (diluted half and half with water) be means of a PDDA. Dilute for cotton clothing (1/2 cup to 1-gallon water). Coverage same as STB and HTH.	Undiluted, it is harmful to skin and clothing. Corrosive to metals unless rinsed, dried, and lubricated after decon.	Remove from skin and clothing by flushing with large amount of water. Contains about 5.25% available chlorine. Store in cool place.
Detrochlorite	A thickened bleach containing (by weight) 19.3% diatomaceous earth, 0.5% anionic wetting agent, 2.9% calcium hypochlorite (70% available chlorine), and 77.3% water. Apply to vertical surfaces by means of a PDDA. Following a contact time of at least 30min, the mixture is removed by washing the surface with water.	Very corrosive to metals. Mix wetting agent and diatomaceous earth with water before adding the calcium hypochlorite. Mixing the wetting agent and calcium hypochlorite in a dry undiluted state may result in an explosion.	Average coverage is 1gal/8yd^2 (7m^2).
Caustic soda or lye (sodium hydroxide).	Average application: 1gal/m^2 on horizontal surfaces; solution strength should be 10% by weight.	Highly toxic. Corrosive to skin, eyes, and clothing. 5% solution will deteriorate wool and cotton. Highly corrosive to most metals. Solution should not be mixed in aluminum, tin, copper, or zinc containers.	Remove immediately from skin and eyes. Keep caustic soda solution in steel or glass containers equipped with rubber stoppers, wired or taped in place when not in use. Store solid caustic soda in sealed steel drums to keep dry.

Table H-7. Biological Agent Decontamination Methods

Item	Method	Remarks
Buildings: Exterior.	Apply detrochlorite. Leave on at least 30min, then flush with water. Apply STB slurry to vertical surfaces by manual means or PDDA. Slurry may be left on exteriors. Weather.	Sun and rain eliminate most microorganisms within 1 day.
Interior.	Use BPL vapors, spray 1 quart BPL/6,000ft^3 of space. Aerate thoroughly afterwards. Fumigate with formalin and steam. Spray approximately 1ml of formalin/ ft^3 (4/5qt per 1,000ft^3). Wash with soap and water.	Seal building before fumigation and aerate thoroughly afterwards.
Air (in inhabited enclosed spaces).	Filter air by means of protective collector.	Air relatively free from microorganisms.
Porous walls, and floors.	Wet with water.	Will help prevent secondary aerosols, but does not decon.
	Apply 2% household bleach solution..	Suitable to limited extent for some types of terrain.
	Apply slurry of 7 parts STB and 93 parts water (by weight).	May be applied by PDDA on large areas.
	Apply caustic soda.	

Chemical Decontamination. Table H-8 focuses on the type of decontaminants, standard and nonstandard, that may be used on chemical agents. Table H-9, discusses facility decontamination focusing on the surfaces and decontaminants rather than on how to accomplish the decontamination.

151 **Table H-8. Decontaminants for Toxic Chemical Agents**

Decontaminants	Chemical Agents	Remarks
Detergent and wetting agent GUNK	Persistent effect agents, G-agents	Water-dispersible solution (1.34-lb GUNK per gal. kerosene)
HTH (High Test Hypochlorite)	Blister agents and V-agents	Oxidizing agent; releases chlorine
Sodium carbonate (washing soda)	G-agents, irritant agents	White, alkaline powder; dissolves easily in water
Sodium hydroxide (caustic soda or lye)	Persistent effect agents, G-agents	Water solution (0.5-lb lye per gal. water)
Sodium Hypochlorite (household bleach)	Blister agents, G- and V-agents	Unstable as solid; more stable in solution; 5% available chlorine
STB (super tropical bleach)	Blister agents, G- and V-agents	White powder containing 30% available chlorine
Steam	Blister agents, G-agents	Hydrolyzes certain chemical agents
Soap and water	Blister agents, G-agents	
DS2 solution	All chemical agents	Applied by M11/M13 apparatus or by brushes, brooms & swabs
Fuller's earth	All liquid agents	Powder that absorbs contamination
Chloramide powder	Blister, G- and V-agents	Effective against fine droplets and vapors only
Slurry, hot soapy water, alkali solution DS2, chloramide powder	G-agents (GA, GB, GD)	STB and GA produce toxic vapors; use steam and ammonia in confined areas
DS2, slurry, 5% sodium hypochlorite solution, chloramide powder	V-agents	Liquid V-agents do not evaporate rapidly or freeze at normal freezing temperatures; absorbed agents remain toxic for some time
STB, slurry, DS2, Fuller's earth	Mustards (H, HD, HN, HQ, HT)	Dry STB on liquid mustard produces flame and toxic vapors; STB stable in sealed container up to 10 years.
STB, slurry, DS2, water, or caustic soda	Lewisite (L), mustard-lewisite mixture (HL), phenyldichloroarsine (PD), etyldichloroarsine (ED), methyldichloroarsine (MD).	Decon products are toxic, fairly stable, nonvolatile, and insoluble in water; alkali solutions destroy vesicant properties
Large amounts of water or DS2	Phosgene oxime (CX)	Liquid above 39°F; readily soluble in water
Water followed by alkali solution or DS2	Phosgene (CG)	CG liquid below 47°F
Sodium hydroxide solution or DS2	Cyanogen chloride (CK), hydrocyanic acid (AC)).	CK liquid below 55°F; AC liquid below 77°F.
Slurry or DS2	Adamsite (DM)	Aeration is sufficient in the field
Alkali solution or DS2	Diphenylchloroarsine (DA), diphenylcyanoarsine (DC).	Aeration is sufficient in the field
Water or 5-percent sodium bisulfite solution	Chlorobenzylmalinotriol (CS)	Aeration is sufficient for vapors; remains in soil for a long time
Hot sodium carbonate solution, hot sodium hydroxide, or hot soapy water	Chloroacetophenone (CN), CN solution (CNB, CNC, CNS)	Aeration is sufficient for vapors
Water or copper sulfate solution	White phosphorus (WP) or plasticized white phosphorus (PWP)	Submersion in water extinguishes burning WP/PWP; copper sulfate prevents further burning
Alkali solution water followed by alkali solution or hot soapy water	Sulfur trioxide-chlorosulfonic acid (FS)	Corrosive to metals when moist; acidic, destroys nylon and paint, almost immediately
Water or alkali solution	Titanium tetachloride (FM)	Corrosive to metals
Water or alkali solution	HC mixture (HC)	No decon required for vapor; high concentrations toxic
Hot soapy water	BZ	

152

153 **Table H-9. Chemical Contamination - Facilities Decontamination**

Structure	Decontamination Method	Remarks
Exterior Building:	Apply detrochlorite. Leave on at least 30min, flush with water.	Apply STB or dry mix on ground where any waste water/liquids flow
Wood or Masonary, Roofs	Apply STB slurry to vertical surfaces by manual means or PDDA, slurry may be left on exteriors.	This applies to all types of surfaces.
	Weather.	Sun and rain eliminate most micro-organisms within 1 day.
	Apply slurry with PDDA, brooms, or swabs. Let slurry remain 12-24hrs; flush and repeat application, then flush again.	
Canvas, Tarpaulins Tents	Immerse in boiling soapy water for 1hr. Use 5% solution of washing soda for G-agents. Launder by standard methods. Aerate (except for V-agents). Use slurry. Use chloramide powder.	Dispose of these items. Use these measures only for extraordinary circumstances.
Interior	Use BPL vapors. Spray 1qt BPL/6,000 ft^3 of space. Aerate. Wash with soap and water.	Seal building before fumigation and aerate thoroughly afterwards with formalin and steam. Spray approximately 1ml of formalin/ ft^3 (4/5qt per 1,000ft^3).
Air (in inhabited enclosed spaces).	Filter air by means of protective collector.	Renders air free from chemical agents.
Glass	Use DS2. Wash with hot soapy water. Wash with clear water or organic solvent.	Blot off surface. Aerate. Weather.
Lenses	Use DS2. Wash with hot soapy water. Wash with clear water or organic solvent.	Blot off surface. Aerate. Weather.
Machinery	Use DS2 and rinse. Wash with hot soapy water. Weather.	Apply grease to moving parts.

154
155 **TERRAIN DECONTAMINATION**
156
157 To decontaminate a facility it may also be necessary to decontaminate surfaces leading to the
158 facility. The manpower and resources expended to decontaminate a road can be prohibitively
159 expensive and time consuming. Conduct terrain decontamination only after a very careful
160 weighing of all alternatives. Consider Table I-10 below if terrain decon is essential.
161
162 **Table I-10. Road Surface Decontamination**

Contaminated Surface or Object	Recommended Methods		
Asphalt Roads	Flush with water. Spray with slurry from PDDA	Cover with STB; when liquid contaminant is visible and personnel are nearby, use dry mix	Weather. Cover small areas or paths across roads with 10cm (4in) of earth.
Brick and Stone Roads	Spray with slurry from PDDA or apply with brushes and brooms. Let remain 24hrs, then flush with water.	Wash with soapy water, preferably hot.	
Concrete Roads	Spray with slurry from PDDA.	Cover with STB or dry mix.	
Hard Surfaced roads (Packed dirt, gravel -not loose surfaces)	Pour, spray, spread oil.	Cover with STB; when liquid contaminant is visible and personnel are nearby, use dry mix	

163
164

APPENDIX I
RETROGRADE OF EQUIPMENT WITH RESIDUAL NBC CONTAMINATION

PURPOSE

This appendix provides detailed procedures for determining and reducing residual contamination levels on equipment contaminated in a nuclear, biological, and/or chemical battlespace environment. Procedures are also included for marking this equipment; maintaining historical records; conducting periodic monitoring; and transporting this equipment out of the Joint Operational Area (JOA) to a CONUS retrograde destination.

OBJECTIVE

The safety of service members and transport personnel is of foremost concern during the CONUS retrograde of equipment with potential residual or low-level NBC contamination. These procedures are intended to: 1) protect personnel against low-level NBC exposure resulting from maintenance or transportation contact/actions; 2) conserve valuable assets; and 3) maintain DOD life cycle control of previously contaminated equipment. With current decon technology constraints, it should be recognized that some equipment may require extensive weathering to meet safety objectives, and in some cases, equipment may require destruction in theater.

OVERVIEW

For purposes of this document "Residual Contamination" is defined as: 1) post-attack/incident contamination not detectable by standard field detectors (e.g., CAM, M8A1, M256) and 2) contamination that remains on equipment after thorough decontamination. **Any equipment present in the templated hazard attack area (per ATP 45) may demonstrate residual contamination when monitored by specialized detectors available at specified fixed sites in the JRA.** Following thorough decon, residual contamination risks include potential vapor hazards and limited contact hazards. These risks increase as residually contaminated equipment is consolidated and personnel work around this equipment for prolonged periods particularly in areas with limited air circulation. Risks may also increase as equipment is disassembled for maintenance functions or containerized for shipment.

Suggested retrograde procedures involving chemical agents are based on compliance with published airborne exposure limits. DA Pam 385-61, ***Toxic Chemical Agent Safety Standards***, defines airborne exposure limits (AEL) as, "Allowable concentrations in the air for occupational and general population exposures." Although that document is intended for chemical depot application as opposed to warfighting, its historical provision for the safety of chemical depot workers supports its credibility as a guide to toxic agent safety in a CONUS retrograde scenario. Companion documents include 29 CFR 1910.119 and AR 385-61. Table I-1 provides airborne exposure limits (AEL) for nerve agents GD, GA/GB, and VX; mustard agents H/HD/HT; and Lewisite, L. **Note: Although not necessarily agent workers, this appendix applies the AEL standards of the 8-hour time weighted average for an unmasked agent worker and corresponding ceiling values to DOD/DOD contract personnel involved in CONUS retrograde operations.** It is also recognized that variations of these chemical warfare agents or different agents may be used in the battlespace, in which case, decisions at National/Strategic levels may be necessary. Appendix I, annex 1 lists military and industrial detectors capable of providing detection at these sensitivities and some practical constraints and limitations.

Table I-1. Airborne Exposure Limits

Occupational Scenario	Chemical Agents (mg/m3)				
	GD	GA/GB	VX	H, HD, HT	L
Unmasked Agent Worker 8-hour time weighted average* in any work shift and max exposure in any period (ceiling value)	.00003	.0001	.00001	.003	.003
Source Emission Limit	.0001	.0003	.0003	.03	.03

NOTE:
*** Time weighted average (TWA) = Average exposure limits for an 8 hour day and a 40 hour work week to which nearly all unmasked agent workers can be exposed, day after day without known adverse health effects.**

Although some nuclear and biological retrograde procedures are discussed, understand that methods to mitigate these residual hazards are primarily functions of removal and/or "death" of the agent as defined by nuclear and/or biological decay rates. For residual radiation, if the particles can not be removed, the time required for natural decay is a function of the isotope's half-life and can not be hurried. At which point, distance and shielding between personnel and the equipment is the only means of reducing exposure risks. Biological agents generally "die" within hours after dissemination and/or exposure to ultraviolet light (sunlight). For more robust biological agents, thorough decon and preparation of equipment to U.S. Department of Agriculture import standards will eliminate most health threats; even so, continuing precautions are warranted. Because of the small particle size of the typical biological warfare agent, some agent may adhere to internal equipment surfaces, creating a risk to unwarned maintenance personnel touching facial areas after contact with these internal surfaces.

In addition to the N, B, and C considerations, this appendix addresses two equipment retrograde scenarios: Emergency Equipment Retrograde and Non-Emergency Equipment Retrograde. The emergency scenario is predicated upon immediate mission requirements such as the depot-level rebuild of a critical shortage end item, e.g., a jet engine. Conversely, the non-emergency scenario is basically a post-conflict redeployment of military equipment. Although an infinite amount of time is unrealistic for non-emergency retrograde, planning should address significant time requirements for agent weathering.

CONCEPT OF THE OPERATION

The safe retrograde and long-term disposition of equipment with residual contamination requires a thorough understanding from equipment operator to CJCS of the associated risks and the minimum requirements necessary to mitigate those risks. Figure I-1 identifies the minimum essential tasks associated with these retrograde operations. Responsibilities and detailed guidance for performing these tasks follow in later discussion.

Figure I-1. Minimum Essential Tasks

Figure I-2. Goals

Generally, three words capture the goals of NBC retrograde operations (fig. I-2): Mission, Protection, and Control. Prioritization of these three goals is a function of operational timing and the extent of contamination. For example, under emergency conditions, strategic and/or operational objectives may warrant increased risks and require increased protective postures to meet mission requirements. However, in a non-emergency situation, those same risks may be unacceptable and more stringent contamination control measures may be required to support lower individual protection levels.

Emergency Retrograde Concept

The emergency retrograde concept shown in figure I-3 is based on the presumption that conflict is ongoing and that failure to return critical items to CONUS or intermediate locations may result in unacceptable strategic and operational mission impacts. Examples might include the retrograde of critical items such as jet or tank engines requiring depot rebuild. If these items were contaminated after removal, the risks associated with their transport to depot and their subsequent disassembly would normally result in significant delays for extraordinary decontamination measures and weathering. If however, mission requirements necessitate speedy return to depot, then risks must be mitigated with additional contamination control measures and increased detection and protection for transporters and maintainers.

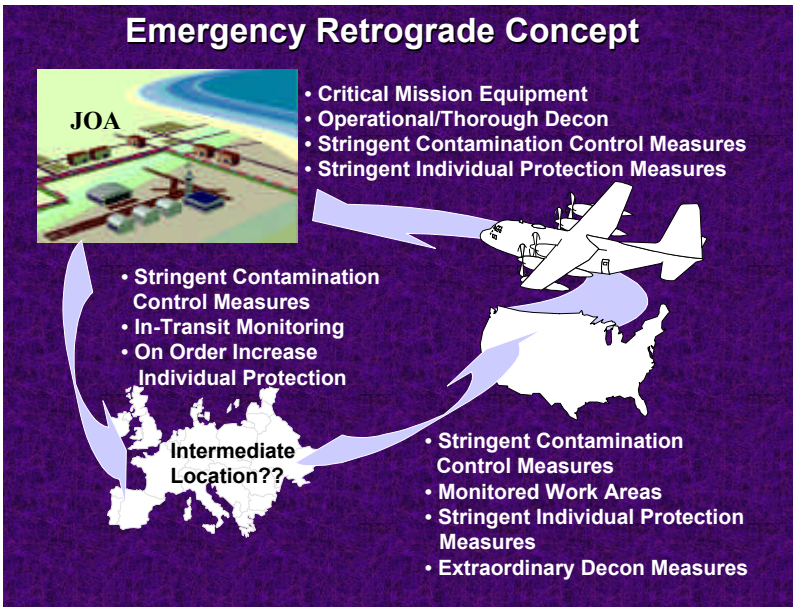


Figure I-3. Emergency Retrograde Concept

Non-Emergency Retrograde Concept

The non-emergency retrograde concept shown in figure I-4 assumes post-conflict conditions allowing time for extraordinary decon and weathering in the JOA before transport to CONUS destinations. Personnel assisting the JRAC with retrograde detection/monitoring and preparation of the equipment will require stringent personal protection and specialized detectors since these preparations may require continuous operations for weeks or months. As suspect equipment is consolidated for monitoring, decon, and weathering, security and buffer zones around the consolidation site help provide additional contamination control measures to protect forces and HN. Although extensive measures will focus on obtaining AEL for the 8 hour TWA, agent worker standards; in-transit monitoring and readily available crew protection will remain mandatory. Once in CONUS, precautionary measures continue throughout the remaining equipment life cycle including DOD control requirements, pre-maintenance monitoring and periodic monitoring. Additional air quality control and legislative requirements may drive considerations yet to be determined.

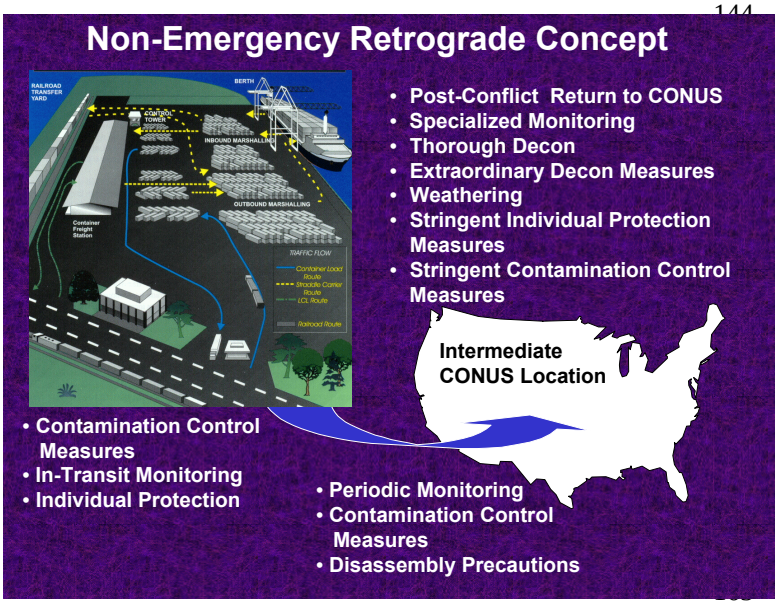


Figure I-4. Non-Emergency Retrograde Concept

ROLES AND RESPONSIBILITY

The following series of figures provides significant roles and responsibilities of key commanders and personnel involved in the retrograde of equipment with residual NBC contamination. Critical actions begin at the operator level and continue through the organization ultimately receiving the shipped equipment. The remainder of this appendix provides TTP for how these roles/responsibilities are supported or accomplished.

Figure I-5. Roles and Responsibilities

Figure I-6. Roles and Responsibilities (Cont.)

190

Figure I-7. Roles and Responsibilities (Cont.)

191

Figure I-8. Roles and Responsibilities (Cont.)

TECHNIQUES AND PROCEDURES

Equipment Operator Procedures

Operators have no capability to detect low-level NBC hazards on their equipment; therefore, with minor exception, their post-NBC attack actions follow standard service procedures (see figure I-9). If the operator finds gross contamination, he conducts immediate decon and marks the equipment as contaminated.

Marking NBC hazards is essential to warning approaching personnel and avoiding agent transfer. This marking begins the record of contamination that will follow the equipment for its remaining life cycle. Using standard NATO NBC markers, the operator marks the equipment so that any approaching personnel can see the hazard warning (i.e., front, back, and sides). This marker also identifies the requirement for subsequent operational or thorough decon. Markers should indicate:

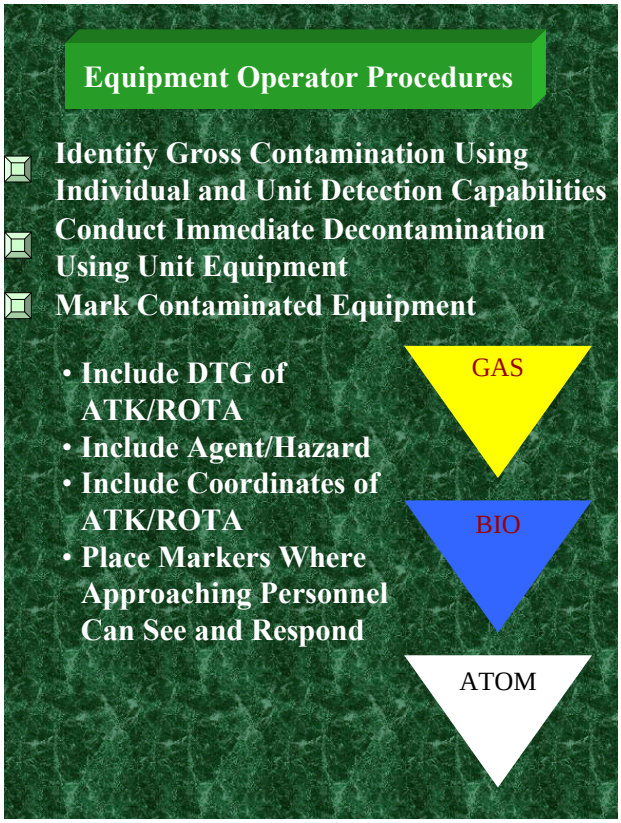


Figure I-9. Operator Procedures

DTG of attack/ROTA; agent/hazard; coordinates for attack/ROTA. If markers are not available, the operator performs this action at the earliest opportunity.

Equipment Owner (Unit) Procedures

Unit commanders are responsible for ensuring their personnel are protected against gross and residual contamination hazards. Actions such as operational and thorough decon are common service procedures in the NBC battlespace environment, and in most cases, these procedures can reduce NBC hazards to negligible risk levels.

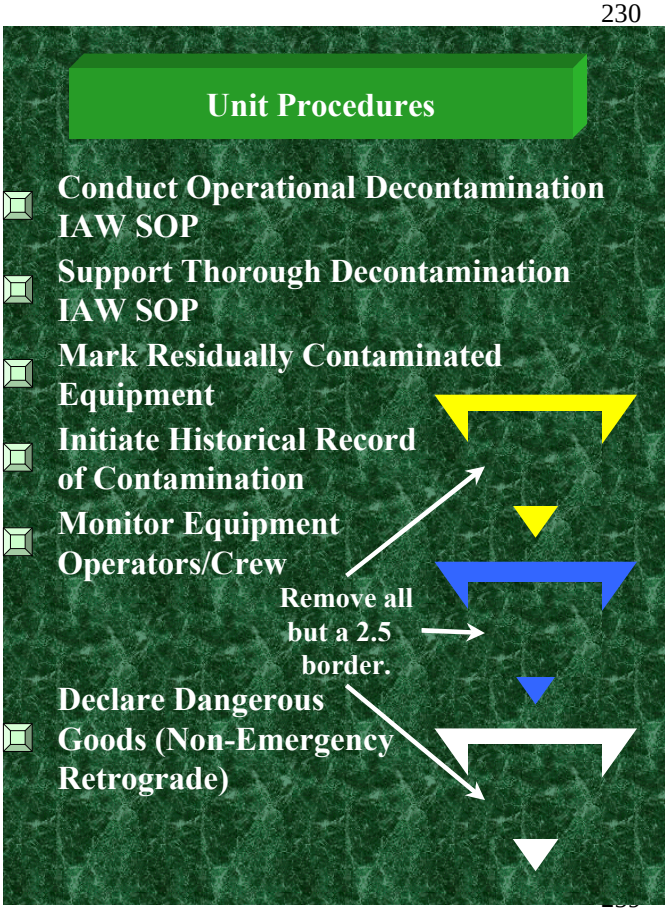


Figure I-10. Unit Procedures

Negligible risk levels allow combat and combat support missions to continue at reduced MOPP postures although precautions for certain groups may continue. For example, mechanics working on previously contaminated equipment should always monitor or take protective measures before dis-assembling equipment components. Also, operators in restricted air flow cabs or compartments use the "buddy system" to observe for any responses to low-level contamination left after thorough decon.

However, the concern with residual contamination is low-level exposure over extended periods; in other words, long-term occupational exposure outside the context of accomplishing specific combat mission objectives. Mitigating these risks requires unit commanders to implement certain command-directed procedures (see figure I-10) including:

- **Special Markings for Residual Contamination.** These markings shown in figure I-10 are placed on any equipment present in the templated ATP 45 attack area that has not already been marked as grossly contaminated by the operator. Grossly contaminated equipment would receive operational or thorough decon, and its marker replaced by "residual contamination markers" when unit field detectors indicate negligible risks. Commanders may choose to centralize execution of this task to their unit NBC reconnaissance or decon teams.

- **Initiation of Historical Contamination Records.** Service maintenance records for equipment with field-detectable contamination are annotated with the following information:
  - DTG of the attack/ROTA
  - Agent/hazard
  - Coordinates for attack/ROTA
  - Means of determining contamination
  - Detector reading/time of reading (if applicable).

Figure I-11 provides an example using DAform2404 as the maintenance record. Other Services use their corresponding forms for recording maintenance status. These records provide important information to the NBC Retrograde Support Element (NBCRSE) that will assist with non-emergency retrograde post-conflict. For instance, in the given example, it is possible that the operator tested a M8 paper interferent that created a green color change (V-nerve). When the NBCRSE does not detect any residual contamination on the equipment, they can correlate attack information on the form with known NBC attacks to help validate or deny the original detection results. Additionally, this form provides an extra warning to maintenance personnel who read it before conducting maintenance procedures.

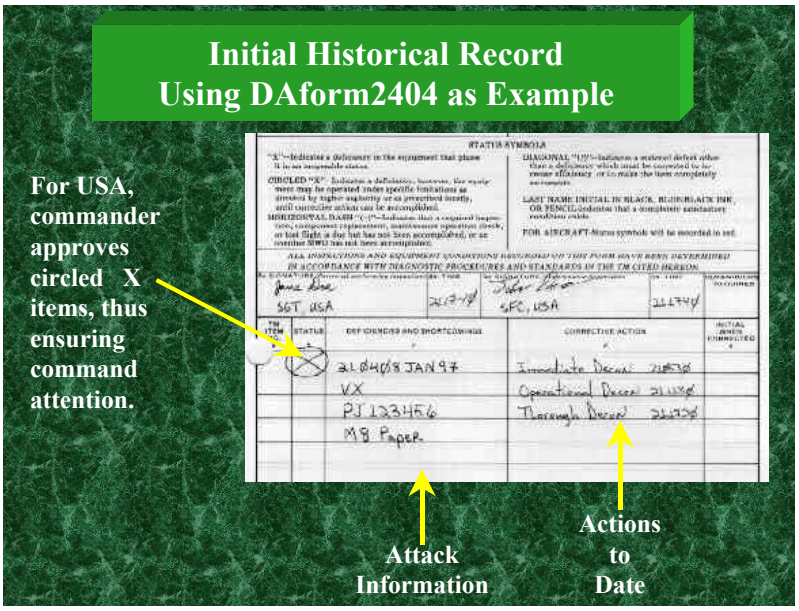


Figure I-11. Example DAform2404

- **Coordinate Retrograde Requirements.** During redeployment planning or when otherwise directed, unit commanders will provide detailed listings of any contaminated equipment and any suspect equipment (equipment present in templated NBC attack areas) through their chain of command to the JRAC. This information allows detailed planning for equipment consolidation sites and necessary decontamination assets required by the NBCRSE. **NOTE: To avoid overload of NBC retrograde sites, it is imperative that unit commanders and staffs conduct equipment triage : if the equipment has not been in templated NBC attack/release areas or has not driven through contaminated areas, it does not go to the NBC retrograde site.**

- **Monitor Equipment Operators.** Commanders should implement procedures to ensure that personnel continuing combat mission support at reduced MOPP levels are alert for signs and symptoms of agent exposures. After operational or thorough decon, commanders may consider periodic monitoring of equipment and personnel especially as rising temperatures increase the risk of agent off-gassing.

- **Receive Retrograde Equipment.** Commanders will receive their retrograded equipment in CONUS. This equipment will have received extensive decon by the NBCRSE and/or weathering; therefore, delays in shipping should be expected. In some cases, contaminant levels may warrant issuing new unit equipment. Although the NBCRSE will decon to table I-1 AEL levels, commanders will ensure historical records are maintained and periodic monitoring is conducted IAW DOD policy.

Joint Rear Area Coordinator and NBC Retrograde Support Element Procedures

Figure I-12. NBCRSE Tasks and Organization Options

The JRAC plays a pivotal role in the retrograde of residually contaminated equipment, whether under emergency or non-emergency conditions. In coordination with the JFC and component commanders, the JRAC determines if mission requirements warrant the risk of emergency retrograde or if other COA are acceptable. Emergency retrograde is discussed separately in Annex 2 to this appendix. To assist with non-emergency retrograde requirements, the JFC/JRAC will task organize the NBC RSE to accomplish specified tasks shown in figure I-12. **NOTE: To avoid overload of NBC retrograde sites, it is imperative that unit commanders and staffs conduct equipment triage : if the equipment has not been in templated NBC attack/release areas or has not driven through contaminated areas, it does not go to the NBC retrograde site.**

- **NBCRSE.** Figure I-12 identifies tasks conducted by the NBCRSE and recommended units/organizations that may have organic capabilities to support the element's mission.

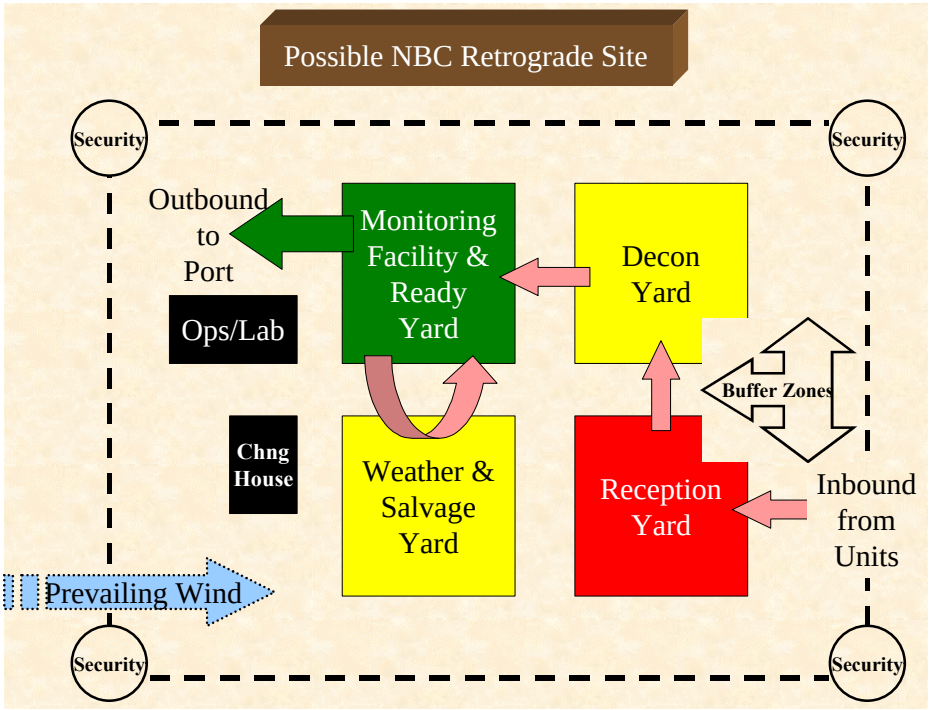


Figure I-13. Possible NBC Retrograde Site

- **Isolate/Quarantine Equipment.** As equipment with known or suspected residual contamination is consolidated into assembly areas, risk of vapor exposure may increase due to equipment off-gassing. Redeployment planning should address requirements for isolated consolidation point(s) for equipment with NBC residual contamination. Figure I-13 provides suggestions for layout or construction of such a site. Anticipate using engineer forces or contractors to construct complex sumps allowing pretreatment of decon effluents prior to release into water systems or existing sanitation/wastewater treatment facilities. Construction of buildings to support monitoring and laboratory operations, labor force change houses, and security facilities are added requirements if existing areas do not provide for these critical functions. Commander, Army Materiel Command can provide critical expertise to help design, equip, man and operate this facility. For example, this command already has mobile laboratories and change houses mounted on trailers for use at its various depots. A subordinate command, the Chemical and Biological Defense Command (CBDCOM) can provide additional expertise for inclusion of local micrometeorological sensors and centralized detector networks emplaced throughout and outside the site.

- **Reception Yard Operations.** During ODS, retrograde operations required over 800,000 gallons of water per day just to clean dirt from equipment at one port facility. This drives the requirement that unit commanders are responsible for conducting or supporting operational and thorough decon before arrival at the NBC retrograde site. Reception yard operations (fig I-14) may require extensive areas to allow separation of various functions such as property book and accountability transactions, containerization of small or loose items, or segregation of equipment types. If large numbers of equipment at the NBC retrograde site will create months of delay prior to shipment home, permanent property book transactions may occur to remove the property from the delivering unit's records, and new equipment issued at home station.

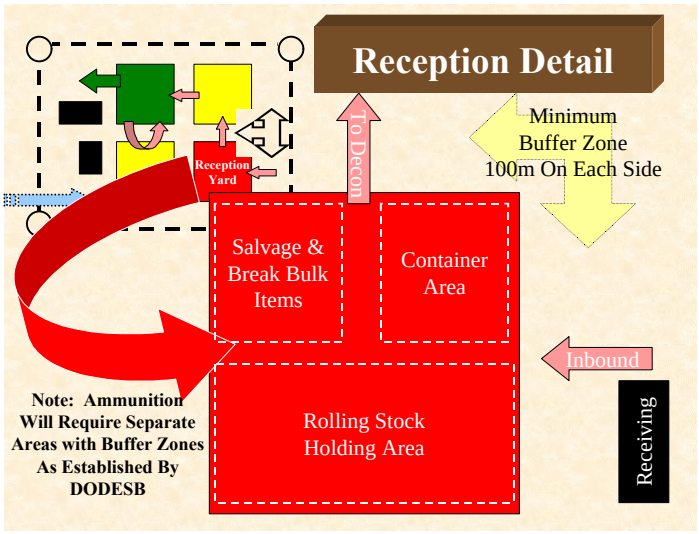


Figure I-14. Receiving Yard Detail

- **Decon Yard Operations.** The decon yard is where the last attempts are made to use water and decontaminants to reduce contaminant levels to meet AEL standards. As such, it has some features not normally associated with thorough decon, and as a fixed site decon facility, it has additional contamination control measures for runoff (see figure I-15). **NOTE: Due to its neutralizing affects on some agents, concrete is the preferred surface for the decon yard.** Decon yard operations will be labor intense and will require detailed management of work-rest cycles. Fielded decon equipment has been selected, in addition to other criteria, to minimize high pressure damage to equipment; as such, **it is not the best choice for decon operations at this site**. At this point of the retrograde operation, potential paint and glass damage from commercial, high-pressure cleaners is an acceptable alternative to unacceptable contamination emission levels. After decon, equipment is monitored using a low-level alarm system such as ACAMS, MINICAMS, and RTAP (see Annex 1), and modified air sampling procedures. These

procedures may range from drawing air samples from containerized equipment to using large plastic sheeting and sand bags to capture off-gassing vapors for analysis. Further monitoring occurs in the monitoring facility; however, the intent here is to recycle

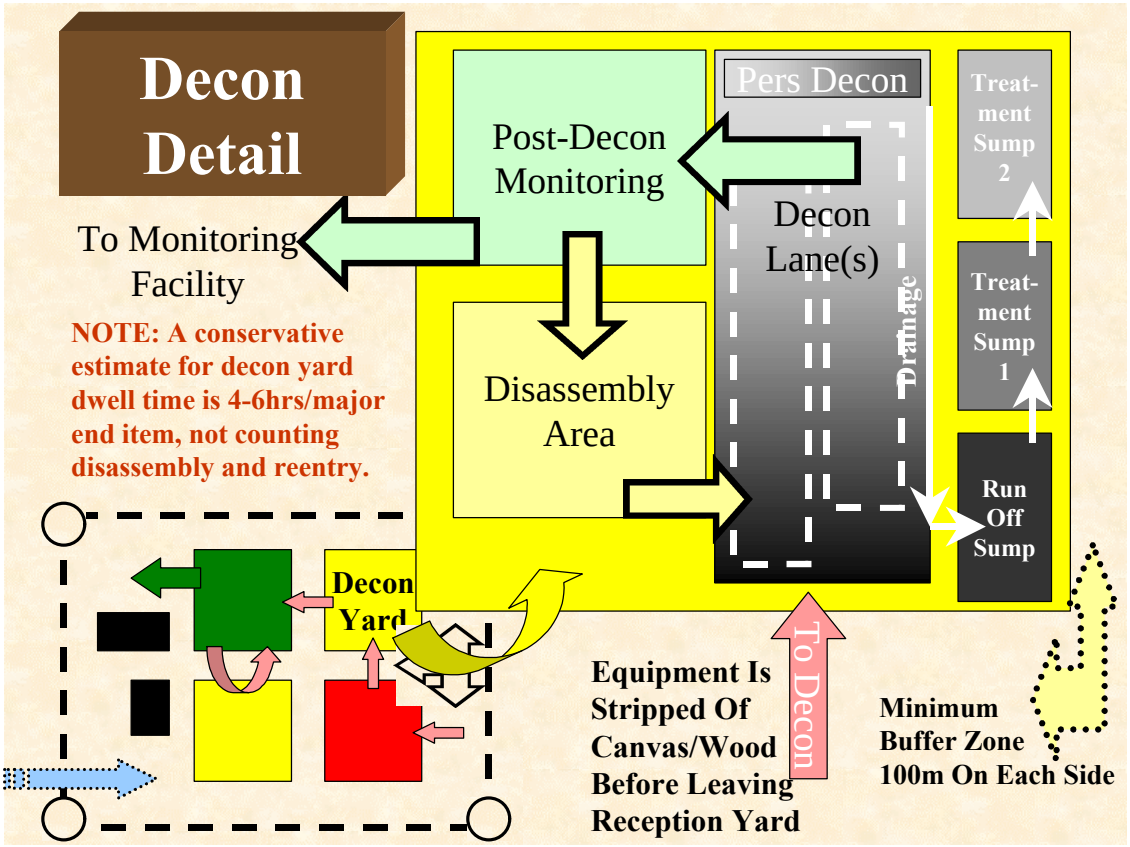


Figure I-15. Decon Yard Operations

equipment through the disassembly point and decon line based on preliminary detection results. Maintenance specialist for identified critical end items must be trained and available to perform disassembly in protective clothing since removal of such items as hubs and road wheels may improve decon results. Assistance and special handling equipment is required to move these disassembled end items back through the decon line and monitoring areas. The intent of such drastic measures in the decon yard is that **no equipment returns to this yard**; if it fails monitoring standards in the monitoring facility, the only remaining alternative is extensive weathering.

- **Monitoring Facility and Ready Yard Operations.** Equipment leaving the decon yard has past a preliminary screening using low-level alarms. At the monitoring facility, equipment is monitored at known temperatures, and in some cases heated temperatures, over an established time period; generally 24 hours (assuming continuous operations), using low-level detectors such as bubblers and DAAMS (see Annex 1). As in the decon yard, modified sampling procedures may be required. Figure I-16 offers some suggestions for preparing large equipment for sampling. Equipment meeting AEL standards shown in table I-1 over the 24 hour period, moves to the ready yard until transported to port for shipment to CONUS. Before shipment, permanent markings like those shown in fig. I-10 are painted on the equipment where approaching personnel will see them. Additionally, the same entries made on the operator maintenance form (see fig. I-11) are made permanently on the equipment's DD form 314.

Failure to meet AEL standards during the 24 hour testing, results in movement to the weather and salvage yard for extensive weathering and/or decisions on final disposition. **NOTE: Efforts to save/decon items to an acceptable standard must be balanced against their replacement cost; therefore, it is feasible that a large number of items will require destruction and/or treatment as hazardous waste.**

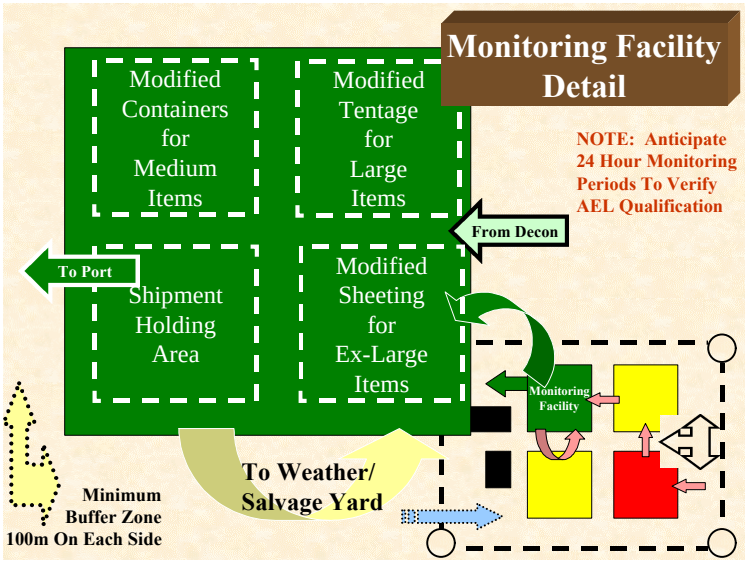


Figure I-16. Monitoring Facility Detail

- **Weathering and Salvage Yard Operations.** Operations here include continued contamination reduction using weather and removal of suspected vapor-producing parts. Disassembly may mirror that at the decon yard or may be even more drastic. For example, tires and wheel hubs may have already been removed so further efforts may focus on wheel wells, running boards, and air filter systems. Contract sells to commercial decontamination ventures are already used to resolve hard to handle radioactive equipment contamination problems, and similar approaches may be considered for chemical contamination as well. Additional options include the use of mobile decontamination technologies currently under development by CBDCOM. Figure I-17 suggests a layout for this area.

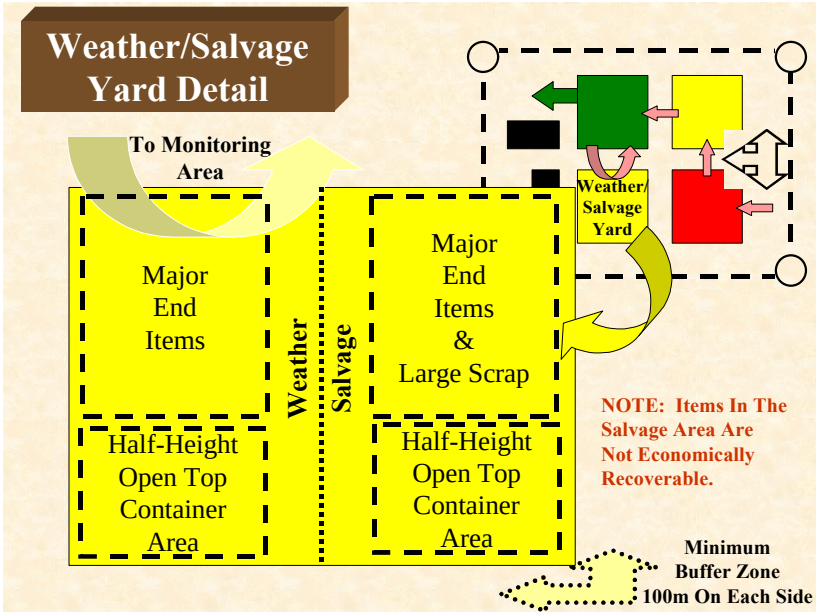


Figure I-17. Weathering/Salvage Yard Detail

- **Site Support and Operations.** The NBC retrograde site requires extensive support and operations oversight. Figure I-18 identifies some major areas of consideration necessary for protecting site personnel and equipment; namely, networked detection and warning systems and physical security. Additionally, laboratory support is necessary to provide

quick results for sampling operations. In addition to the personnel decon site in the decon yard, site personnel will require a change house and rest areas as well. A medical surveillance station can be collocated in a separate section of the change house or in another building other than operations. The operations center should have communications with every functional yard/area, as well as, a public address system capable of warning any yard/area at the site. Agencies such as the US Dept. of Agriculture, Dept. of Energy, Customs Service, and EPA will provide critical input to procedures and decisions regarding acceptability for transport to CONUS.

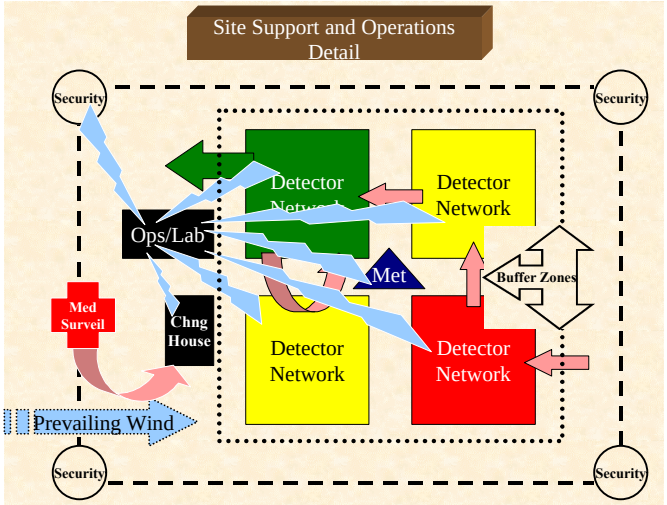


Figure I-18. Site Support and Operations Detail

Designated Transport Commander

The designated transport commander, whether sea, air, or land, has the final decision authority regarding the transport of NBC retrograde items and the safety of the crew. To help determine the risk involved, transport commanders are encouraged to observe retrograde site operations either directly or by representative. An alternative is to conduct separate monitoring operations; however, that requires additional resources already stressed from supporting the NBC retrograde site. In either retrograde scenario, the USA Army Materiel Commander can be requested to provide trained personnel to monitor cargo and crew areas while in transit. Under emergency retrograde conditions the optimum situation is post-decon shipment in an airtight container. This minimizes risks of cargo compartment vapor hazards and allows the crew to conduct operations unencumbered by MOPP in monitored crew and cargo compartments. In most cases, non-emergency retrograde is expected to occur by sea. Figure I-19 demonstrates the movement of containerized cargo above deck. If cargo can not be shipped top side to maximize air circulation or in air tight containers; monitoring the cargo hold area and designated crew areas, based on equipment location and ship design, is recommended. Regardless the transport or configuration means, commanders will have to ensure crews are proficient at recognizing signs and symptoms of agent exposure or contamination, as well as, immediate actions and warnings. Pre-mission rehearsals and drills should also address abort criteria as determined at CJCS level. Figure I-20 provides a minimum checklist of mission considerations/actions.

Figure I-19. Example of Top Side Cargo Shipment

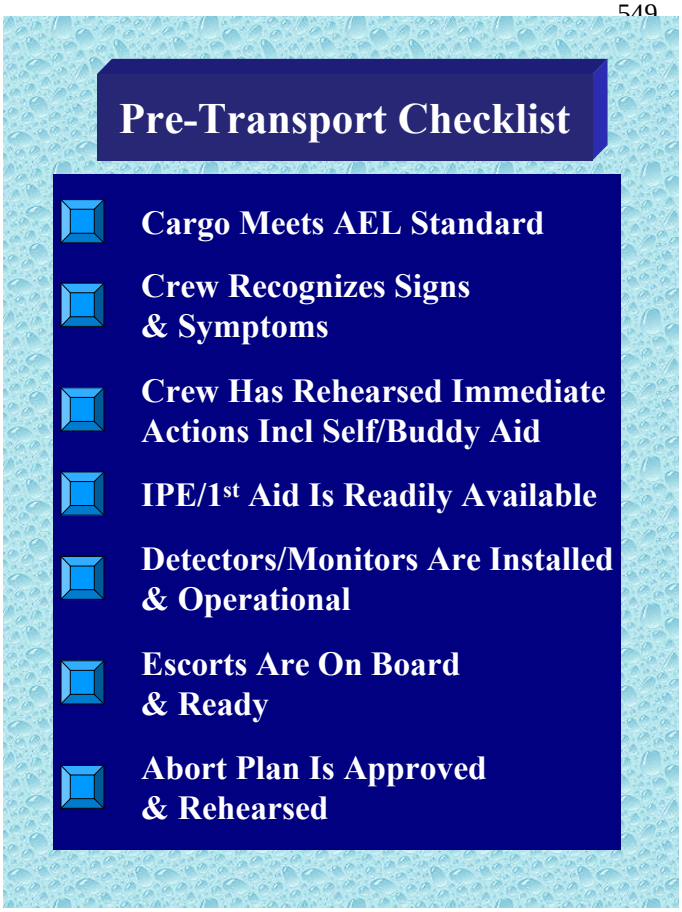


Figure I-20. Pre-Transport Checklist

Receiving Organizations

Upon arrival in CONUS, equipment will require clearance through the US Customs Service as a minimum. Early coordination with this and other US agencies at the NBC retrograde site is intended to expedite CONUS arrival procedures. See Annex 2 for specific emergency retrograde procedures. Containers may be opened without protective equipment once the AEL standard is confirmed by the accompanying escort. After clearance, the cargo will continue by designated means to its final destination. Escorts should continue with the cargo to final destination and ensure that any stops or transfers include appropriate security measures to preclude risk of contact exposure to curious civilians. Receiving installations will store equipment in designated areas determined by coordination with DOD and the EPA. Commanders will conduct periodic monitoring IAW DOD policy and will ensure all previously contaminated equipment remains under DOD control for the remaining equipment life cycle. This includes the maintenance of markings and historical records, as well as, any parts that may be removed for subsequent maintenance. Removed parts not repaired and replaced must be destroyed as hazardous material (currently by incineration).

LOW-LEVEL CHEMICAL AGENT DETECTORS

Low-level chemical agent detectors are those detection devices that can provide detection capability and/or alarm for concentrations of 0.003mg/m3 for mustard, 0.0001mg/m3 for GA/GB, and 0.00001mg/m3 for VX. Examples include Absorption Air Samplers (bubblers), Depot Area Air Monitoring System (DAAMS), Automatic Continuous Air Monitoring System (ACAMS), and Real Time Monitors (RTM). Table I-1-1 provides available detectors and their corresponding sensitivities and response times.

LOW-LEVEL CHEMICAL AGENT ALARMS

Low-level chemical agent alarms are devices used in conjunction with a low-level monitor or detector which produce audible sounds when a predetermined level of detection below the AEL is obtained. Examples include ACAMS, Miniature Continuous Air Monitor (MINICAMS), and Real Time Analytical Platform (RTAP). Table I-1-1 provides available detectors and their corresponding sensitivities and response times.

Table I-1-1. Low-Level Chemical Agent Detectors, Sensitivities, and Response Times

Detector Type	Response Time	Agent Sensitivities (mg/m3)					
		L	H	GA	GB	GD	VX
Bubbler	2-4 hrs 8 hrs	0.005 0.003	0.003	0.0001	0.0001	0.00003	0.00001
DAAMS	1 hr	N/A	0.003	0.0001	0.0001	0.00003	0.00001
ACAMS*	3-5 min	N/A	0.003		0.0001		0.00001
RTM	8-12 min	N/A	N/A		0.0001		0.00001
MINICAMS*	≤ 15 min	N/A	0.003		0.0001		0.00001
RTAP*	≤ 15 min	N/A	0.003		0.0001	0.00003	0.00001

NOTES:
Information from DA PAM 385-61.
***Detectors shown subdued have alarm capability.**

Detector Photos TBP.

22

EMERGENCY RETROGRADE DECISIONS

Define and Communicate the Emergency. Before initiating actions to retrograde potentially contaminated equipment for CONUS repair/rebuild, the JRAC determines if the emergency conditions and risks involved warrant such action. In some cases, it may be advisable to seek additional assistance in providing new items vice CONUS repair/rebuild. Regardless, the intent to retrograde residually contaminated equipment must be communicated through the CJCS due to potential risks and political/environmental sensitivities.

Determine the Impact(s). Emergency retrograde may require valuable lift assets that must be protected for future use. Additionally, selected aircraft will require installation of specialized, low-level detectors in crew and cargo compartments, and crews prepared to respond to increasing vapor levels by donning IPE. If air-tight containers are unavailable to containerize the cargo, crew risks increase, as well as the likelihood of pilots having to fly in protective masks. **In most cases, these risks are not acceptable.**

EMERGENCY RETROGRADE PROCEDURES

Preparation. When mission requirements outweigh the potential risks of NBC emergency retrograde, these minimum actions should occur as preparation for movement:

- **Thorough Decon.** Take additional time to remove any parts not necessary for the CONUS action. Be meticulous with thorough decon procedures. If commercial, high-pressure, steam cleaners are available, use them to augment the final rinse station. If low-level detectors are available at the decon site, use them at the check/monitor station.

- **Mark Equipment and Initiate Historical Record.** Use the procedures addressed in Appendix I, non-emergency retrograde discussions.

- **Prepare Shipping Container(s).** AFJMAN 24-204, *Preparing Hazardous Materials For Military Air Shipments*, addresses the packaging of chemically contaminated cargo in hermetically sealed bags and open head metal drums with air-tight gaskets or using double air-tight drums. Advanced coordination with the Air Mobility Command is essential for cargo that will not fit into these containers. Extreme measures to protect the aircraft from contamination are warranted since these aircraft support missions worldwide. Most jet engines and some other major end items have air-tight shipping containers. However, some of these containers also have pressure relief valves that must be sealed to ensure containment of off-gassing vapors. Additionally, **when preparing to modify containers for NBC retrograde shipments, do not assume that water-tight equals air-tight.** Many containers are constructed with baffles to keep out water, but they allow air circulation unless all air entry/exit points are sealed. Container modifications may also include modified gaskets around doors and one-way ports for in-transit air monitoring if necessary. In addition to modifying ANSI/ISO containers, the Equipment Deployment Storage System (EDSS) QUADCON, TRICON, and ISUs offer smaller volume options (see FM 55-80).

- **Monitor the Sealed Container.** If time permits, use a low-level detector and previously discussed modifications to monitor the sealed container for at least two hours to verify AEL compliance.

- **Follow the Checklist.** Use the pre-transport checklist provided as figure I-20, page I-14 to ensure appropriate actions are rehearsed and protective equipment is readily available. Ensure monitors are installed in the crew and cargo compartments. The US Army Materiel Command can provide assistance with detector installation.

Shipment. Escort personnel from the US Army Materiel Command may be present to help monitor crew and cargo compartments during the flight. If not, load masters should receive training on the operation of the installed detectors.

CONUS ACTIONS

Receiving agencies should prepare to monitor inbound containers before opening. If container modifications do not include internal air sampling ports, move the container(s) to a designated isolation area to be opened only by a qualified, toxic agent worker in level A protection. After determining vapor concentrations, proceed with necessary actions in the appropriate protective posture. Although work without protective masks may be permissible at AEL levels, contact hazards may continue to pose risks that are mitigated by wearing protective butyl rubber gloves. As the item(s) is disassembled/repaired, work in a monitored environment. Exchange economically replaceable sub-components prior to reassembly and remember that any parts removed must be controlled or destroyed (currently by incineration) as chemically contaminated materiel. If possible, hold the retrograded item as a operational float for issue only under extreme mission requirements, and send a replacement item back to the JOA.

Return procedures/precautions are the same as those used to ship to CONUS; likewise, JOA handling procedures follow the CONUS precautions noted above.

APPENDIX J
NBC PROTECTION OPTIONS

NBC PROTECTION

There are two components of NBC protection -- individual and collective. NBC protection is needed when the chance of contamination from NBC weapons is anticipated or unavoidable. Therefore, fixed site commanders must ensure that their personnel have adequate protection against NBC hazards and the means to sustain continuous operations throughout the hazard's duration.

Individual NBC Protection. Individual protective measures are taken by personnel to survive and continue the mission with a minimal loss in efficiency. Personnel at fixed sites, at a minimum, must have individual protective equipment (IPE) against NBC hazards. This individual protection consists of protective mask, suit, gloves, and boots. Individual protection levels are referred to as mission oriented protective posture (MOPP). There are various levels of MOPP adopted by the armed forces. These levels are designed to allow commanders to increase or decrease the level of protection rapidly without providing long explanations. A commander determines the initial level of MOPP based on MOPP analysis, which finds the balance between reducing the risk of casualties and accomplishing the mission; the level is adjusted as NBC risks change. Remember, degradation in efficiency will occur for personnel placed in heightened individual protection for extended periods. Although IPE provides for survival, both individual and collective protection are necessary to maintain continuous operations.

In many cases, fixed site mission support functions may not allow the benefit of working inside a toxic-free area (TFA). Basic IPE provides the required protection but produces significant performance degradation. Additionally, certain work activity exposures like those referred to in Figure J-1, place the integrity of the protective overgarment at risk. The SCALP shown in Figure J-1 provides an impermeable disposable cover to protect and enhance the protective capabilities of IPE. Selected personnel performing hazardous duties or requiring long hours in a contaminated environment can use special encapsulating suits where no collective protection exists for rest and relief (for example, heavy maintenance bays). This special suit is connectable to portable cooling stations, is operable without the protective mask, and is a system with very high protection factors for extremely hazardous conditions. For more details on MOPP and IPE, see corresponding service doctrine and regulations.

- **LIGHTWEIGHT, IMPERMEABLE SUIT**
- **WORN OVER THE CP OVERGARMENT**
- **PROTECTS CP OVERGARMENT FROM GROSS LIQUID CONTAMINATION**
  - **LIQUID AGENT**
  - **POL AND DECONTAMINANTS**
  - **WATER**
- **PRIMARY USERS**
  - **PERSONNEL IN COLLECTIVE PROTECTION [FOR PERSONNEL EMERGING FOR SHORT DURATIONS (I HOUR OR LESS) LESSENS REENTRY TIME]**
  - **DECONTAMINATION PERSONNEL**
- **INEXPENSIVE AND DISPOSABLE**

Figure J-1. Suit, Contamination Avoidance And Liquid Protective (SCALP).

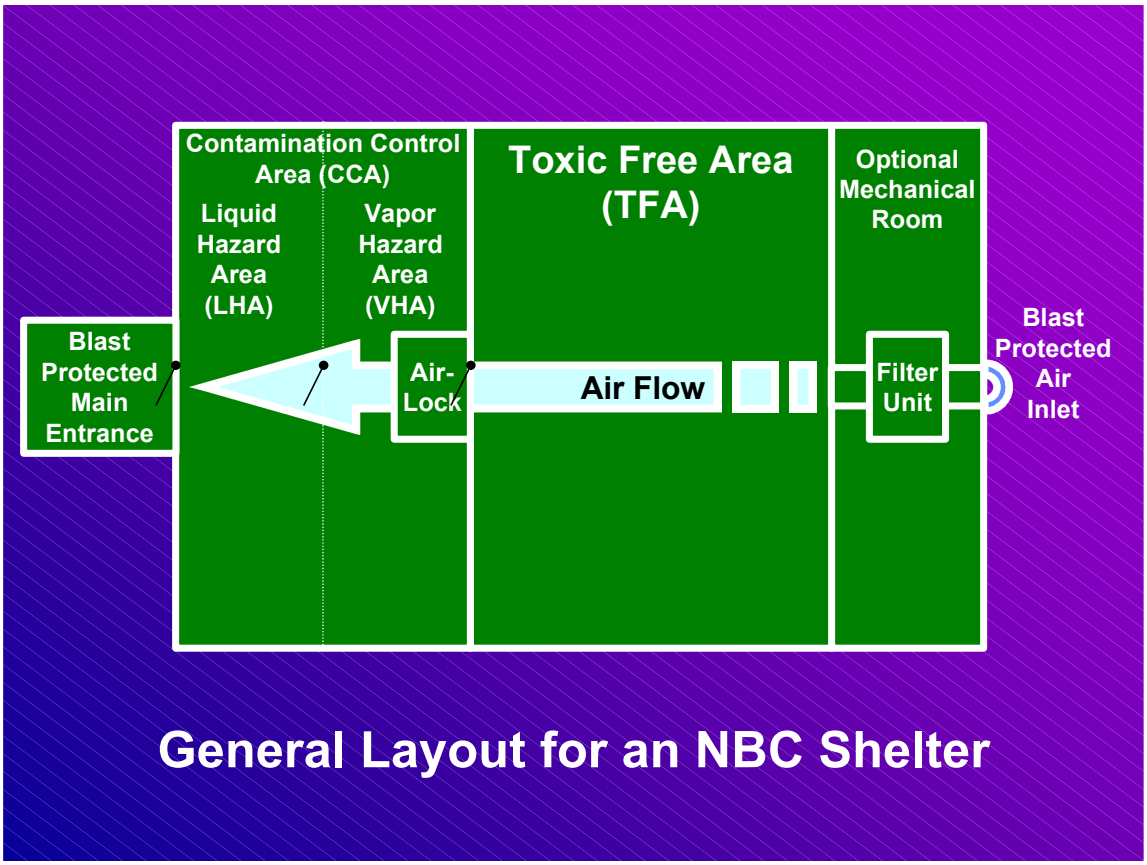


Figure J-2. Basic Shelter Design

Collective Protection. Collective protection is an important aspect of fixed site NBC defense. Ideally, it provides a contamination-free environment for personnel, allowing relief from continuous wear of MOPP equipment. The basic concept applied for collective protection is overpressure and filtration. By filtering incoming air and maintaining higher internal air pressure than external pressure, the contaminated external air is prevented from infiltrating the shelter and results in toxic-free areas (TFA) for work and relief. The human factor is the most variable input of the collective protection equation due to the potential introduction of contamination inside the shelter as a result of poor entry procedures. Figure J-2 shows the basic areas required to ensure the toxic free area (TFA) remains safe for its occupants.

Collective protection supports three primary areas that quickly erode in an NBC environment: personnel rest/relief (breaks and sleeping), work relief (C^4I, maintenance, supply, etc), and protection of logistics storage areas (for example, POMCUS and theater reserve materiel). Based on different mission requirements, each fixed site requires customized collective protection. For example, personnel perform C^4I and light maintenance operations more efficiently in some form of collective protection than when encumbered by high MOPP levels and IPE. Because of the large machinery and frequent need to breach the building's air integrity, personnel performing heavy maintenance and supply operations may have to endure IPE and use collective protection for rest and relief. Fixed sites can use a combination of permanent, mobile, or temporary collective protection shelters. Subsequent discussion addresses permanent modifications to existing structures and expedient/temporary modifications to provide collective protection. Refer to service-specific technical manuals and regulations for details on integrated, vehicular collective protection systems.

Training. Fixed site personnel must demonstrate proficiency in all individual and collective protection measures and rehearse before, during, and after NBC attack actions. Commanders with a predominantly civilian work force may encounter extensive training program requirements in this area. Frequent drills conducted during different shifts and during shift changes help prepare the fixed site to minimize the potential impacts of WMD or TIH on fixed site operations.

NBC COLLECTIVE PROTECTION

The selection of and application of NBC collective protection techniques can be classified into four categories:

Class I: Full integration. Permanent modifications are made to the building(s), and NBC filter units are fully integrated with existing heating, ventilating and air conditioning system (HVAC) system(s). Dampers controlling ventilation openings automatically actuate when filter units turn on. There are permanent accommodations for a contamination control area (CCA).

Class II: Partial Integration. Permanent modifications and sealing measures are made to the building or a portion of it, and partial integration of HVAC filter units or alternate systems allow heating/cooling. Manual dampers control outside air and exhaust. The CCA may be permanent or temporary (e.g., a tent).

Class III: Expedient. Selected portions of the building are sealed by temporary measures such as plastic sheeting and tape. Transportable filter units are temporarily mounted to the building. Heating/cooling systems may or may not be employed. A temporary CCA is established.

Class IV: Secondary enclosure. The building is not tight enough to economically maintain pressurization, but it is suitable for using portable internal enclosures or liner systems such as M28 or M20 collective protection equipment. System allows use of existing heating/cooling system or alternate systems. Examples include warehouses, hangers, and maintenance bays. Figure J-3 shows the M20, Simplified Collective Protection Equipment used to provide a TFA for a command post.

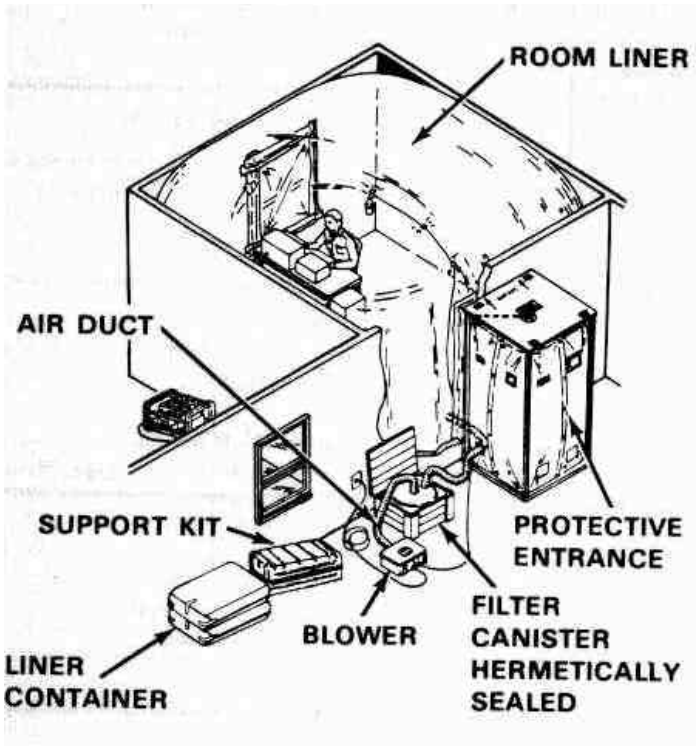


Figure J-3. M20 SCPE

Considerations for Applying Collective Protection to Existing Buildings

The following considerations help determine suitability or choice of collective protection applied. For more detail on specific engineering and equipment specifications, contact the Joint Service Collective Protection Assessment Team through the Edgewood Research, Development, and Engineering Center (ERDEC); the Army Corps of Engineers Omaha; or Pacific Air Forces Command (PACAF). [More detailed contact information TBP]

Tightness of Selected Building. Building tightness (ability to maintain pressure) can vary greatly with the condition of the building and its hidden defects such as unsealed construction openings hidden by drop ceilings or false walls. Fan-pressurization (blower door) testing is the most common technique used for measuring tightness. There is no specific level of leakage that disqualifies a building from collective protection modifications; however, tighter is better due to air filtration unit costs and potential heating/cooling costs. The average expected leakage reduction from weatherizing measures is about 25%.

Methods of Tightening the Building. Each time a collectively protected building is pressurized, its protection envelope must be tightened by closing all intentional openings (e.g., outside air vents, exhaust vents, windows, and doors). Other openings (e.g., cracks, crevices, joints, penetrations for pipes and cables) must be closed to the maximum extent feasible using permanent means such as caulking and weather stripping.

Integration of Filter Units with HVAC System. The HVAC systems in most buildings are ill-suited for the integration of positive pressure collective protection. The least costly approach is often to shut off the HVAC system and block the supply and return vents to the protected envelope when the system is pressurized. Such measures may require alternate heating/cooling methods. Short of major modifications to the HVAC system, the user may have to accept uncomfortable conditions in winter and summer. Figure J-4 shows a modification of an existing environmental control unit with a gas particulate filter.

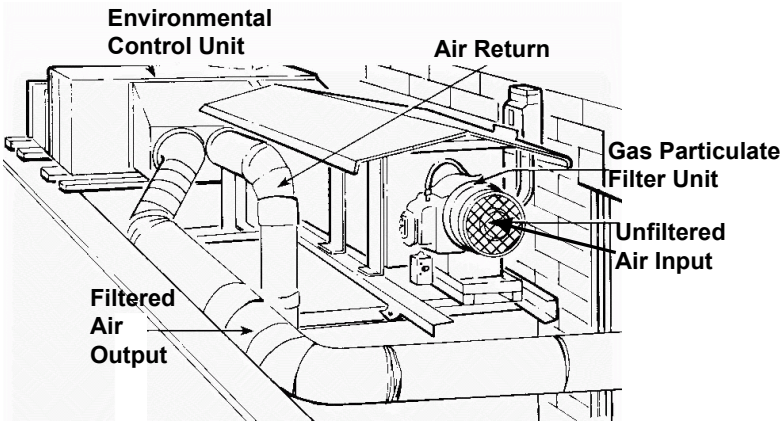


Figure J-4. Modified Environmental Control Unit

Overpressure Levels. The minimum overpressure recommended for stationary collective protection shelters is 0.1 inches water gage (iwg) or 25 Pascal, based on preventing air infiltration at ambient wind speeds greater than 15 mph. At 15 mph, the wind reduces the concentration and dosage of mustard evaporating from the ground by about 98%, compared with calm conditions. When preparing buildings and conducting test measurements, it is advisable to provide for a higher pressurization (0.2 iwg) to ensure 0.1 iwg is still achieved over time as sealing measures and building structures may deteriorate.

> **NOTE: When overpressure is applied to a hospital, the operating rooms must have overpressure at least 0.2 iwg higher than the rest of the hospital; this provides increased positive pressure in the area and prevents infectious organisms from being introduced into the operating room suites from the rest of the hospital.**

Filter Units. The Joint Collective Protection Assessment Team evaluations and methodologies established in 1997 recommends the FFA 580 filter unit for collectively protecting buildings. This 600 cfm filter unit is also integrated into the Survivable Collective Protection Shelter (SCPS) shown later in Figure J-8. The FFA 580 employs the Modular Collective Protection Equipment filter set, which is the most widely used filter set among the USA, USN, and USAF. Where the building would require more than 10 FFA 580 units, employ the M49 Filter Unit or a large-capacity commercial filter unit built to military specifications.

Airlock(s). An airlock is a transition enclosure, a protected entryway in which people wait for a period of 3-5 minutes before entering or exiting the TFA. The main function of the airlock is to prevent direct vapor transport into the TFA. During the airlock purging period, the flow of filtered air through the airlock flushes out airborne contaminants introduced with the opening of the outer door. The airlock also ensures that TFA overpressure is not compromised during entry or exit. For filtered, pressurized air, the airlock may rely on TFA air flow and pressurization which creates variable demand on the TFA pressurization. Using a dedicated filter unit for the airlock reduces the variable demand on the TFA and helps maintain TFA integrity. Figure J-5 shows a locally fabricated airlock with dedicated filter unit from the M20/M28 CPE set as constructed by ERDEC.

Figure J-5. Fabricated Airlock with Filter-Blower Unit

Contamination Control Area (CCA). The CCA and airlock allow people to transition from individual protection to collective protection without introducing contaminates into the TFA. Personnel remove contaminated outer garments in the CCA before entering the airlock. Permanent or interior CCA have a filtered air flow rate sufficient to suppress vapor concentrations from contaminated garments worn into the CCA. Open-air CCA have high air flow rates but the air may not be clean, filtered air. Figure J-6 shows a tent used as a CCA and attached to the airlock.

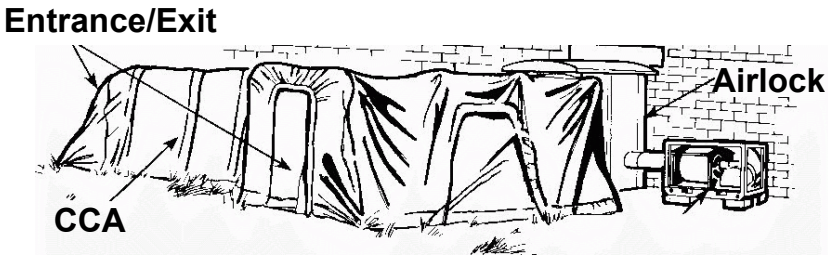


Figure J-6. Tent Used as CCA

Vapor sorption or the adherence of agent vapors to surrounding materials/objects is the primary problem in most CCA. Recent studies indicate CCA procedures require improvements in four areas: 1) Integration of chemical detectors; 2) CCA decontaminant requirements; 3) Use of exchange masks; and 4) Reuse of protective garments.

- **Integration of Chemical Detectors.** The agent vapors in the open-air CCA can actually adhere to the individual after doffing the overgarment and before entry into the airlock. There are four options for detecting and dealing with this problem: 1) Halt entry processing if vapor hazards are detected outside the shelter; 2) Use a Chemical Agent Monitor (CAM) to screen/halt entry candidates with desorbing vapor; 3) Require removal of all garments if CAM or exterior monitors detect vapor and issue new or temporary garments inside the TFA; and 4) Combine showers with previous option. **Using M8 paper to check for contamination prior to shelter entry is**

undesirable as a pre-entry screening tool unless driven by operational requirements.

- **CCA Decontaminant Requirements.** Recent reports indicate that unless under extreme liquid contamination conditions ($10g/m^2$), use of decontaminants/sorbents (e.g., diatomaceous earth or bleach) inside the CCA have little effect on reducing the desorption of vapor inside the TFA.

- **Use of Exchange Masks.** The requirement to maintain eye/respiratory protection throughout the transition process from individual to collective protection and to have masks inside the TFA is common to all services. Due to logistics constraints, the USA procedures do not include an exchange mask, but rather the partial decon and bagging of the individual mask that remains with the owner. Other options being considered include Disposable Eye Respiratory Protection (DERP) and neck-dam type emergency escape masks. Units with the M40-series protective mask might consider modifying doff procedures to include disposal of the quick-doff hood and lens outserts, which would be replaced inside the TFA.

- **Reuse of Protective Garments.** Protective overgarments are not issued in quantities allowing discard each time a person enters a collective protection shelter. The SCALP shown in Figure J-1 provides a low cost option that would allow discard of the outer SCALP while avoiding the discard or reuse of a contaminated protective overgarment.

Shelter Operating Instructions. Ideally, a collective protection system requires only a single power switch to activate the entire system. Except for closing doors and windows, Class I systems function this way. Other systems rely on operator action to close intentional openings not always obvious to the operator. For example, a Class III modified dormitory may require covering over 100 toilet fan grilles. Written operating instructions are therefore essential and should take two forms: a checklist permanently mounted by the control panel and a set of detailed, written instructions for operations, troubleshooting, and maintenance. Figure J-7 provides an example instruction card for Class II or III operations.

Shelter Preparation Time, Manpower, and Training. For large buildings, transition to collective protection may require substantial time and manpower; factors that become considerations for deciding which buildings to modify as Class II

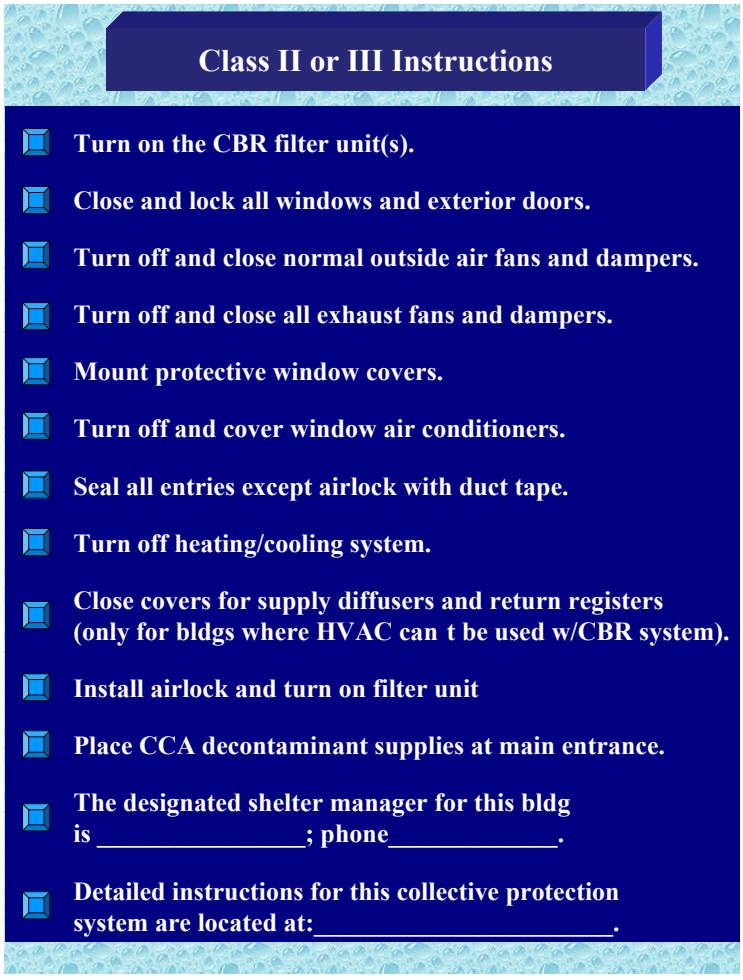


Figure J-7. Example Shelter Checklist

and III shelters. Training and manning shelter management teams requires a focused and well-supervised effort to ensure personnel execute shelter management task to standard and without delay. To avoid personnel turnover problems, consider assigning shelter management teams by position and conducting frequent training/drills. Ensure shelter management candidates will not be diverted to other missions when the NBC threat requires shelter operations. Additionally, plan shelter management assignments to provide 24 hour manning, and anticipate additional support requirements due to changes in shelter occupant loads.

Other Shelter Considerations. In Class I, II, and III shelters, mission equipment, toilet facilities, drinking water, and stored supplies are accessible without requiring additional manpower and preparation time; all of which are planning factors required for Class IV shelters.

Table J-1 provides a summarized listing of the major design elements and considerations for NBC shelters.

Table J-1.

MAJOR DESIGN ELEMENTS AND REQUIREMENTS FOR NBC SHELTERS

ELEMENT	REQUIREMENT
Air Filtration	Integration of gas/particulate filter unit w/existing HVAC.
Ventilation	10 cfm of filter air/occupant.
Positive Pressure	Minimum 0.2 iwg w/alarm to warn of low over-pressure.
Entry Facility (Contamination Control Area)	Area w/overhead cover for removal, storage, decontamination and/or disposal of individual protective equipment. Decontaminants for mask, hood, and gloves. Instructions for entry procedures. Airlock entry (sealed, pressurized, filtered ventilation) is preferred but not required.
Airlocks	One between the contamination control area (CCA) and the toxic free area (TFA) with purging flow of filtered air (multiple airlocks for high entry rates). Timer to indicate completion of purge cycle, and pressure gauges to indicate proper pressure.
Toxic Free Area (TFA)	30-35 ft^2/person. Showers near airlock are desirable. Recirculation filters are desirable.
Detection	Detector for monitoring entries and TFA air. A MICAD-linked detector network is desirable.
Communication	Intercom or phone between TFA and CCA. Communication linkage w/C^4I networks.
Blast Protection	Essential for filter inlets and TFA windows. Blast doors at main entrance.
Toilet Facilities	1/20 personnel.
IPE Storage	1 ft^2/person.
Potable Water	100 liters/person.
Electrical Power	Backup generator w/reserve fuel.
Emergency Masks	Rapid access to personal mask or transient mask for emergency exits.
Food Storage	Reserve Meals Ready to Eat (MRE)/person.

EXPEDIENT NBC PROTECTION

Expedient protection includes steps taken to provide immediate protection of personnel/materiel and to enhance protection of mission essential facilities in the event of a WMD or TIM attack/incident. These procedures are often included in emergency action discussions of "protection in place". The following discussion focuses on four basic concepts.

- **Sealing Air Infiltration Points.** Sealing the inside of a building/room must be done prior to the attack/incident. Particular care must be taken to ensure that all openings that can possibly be sealed are ready for immediate sealing at first warning.

Precut sealing materials for doors and position materials so that final sealing requires minimum response time. Once an attack occurs this door is no longer usable; label the door as being sealed. Based on weather, pre-seal windows and other openings. Seal all air conditioning, and heating vents and ducts leading to the inside/outside. Materials should be precut and positioned, ready for use. Some openings lend themselves to a sealing/packaging material generically referred to as "Foam-In-Place" (Fig J-8.) packaging systems available through local procurement (CONUS).

Foam-In-Place is a generic term for a commercially available packaging/sealing material that expands when sprayed onto a surface/into an enclosed area (such as window openings, spaces between wall studs etc.) . the system consists of 120 to 300 Gal drums (two containers of equal size are required), two hoses, a gun assembly and an oxygen bottle. The Foam consists of two chemicals that are added to the drums and are mixed in the gun assembly as the mixture is sprayed through the gun.

Figure J-8.

CAUTION: Since air circulation and ventilation is restricted using these techniques, execution relies on early warning; rapid action to complete sealing ; and dissipation of the vapor hazard and/or personnel evacuation.

- **Using NBC or Expedient Covers.** Keep supplies indoors if possible, but always keep them covered whether stored indoors or outdoors. Uncover supplies only long enough to retrieve needed items. When practicable, cover all equipment. When not in use, park equipment under overhead cover. See Appendix B for protective covers suitable for equipment. If insufficient covers are available for the amount of equipment/supplies to be covered, prioritize by need and availability to determine which supplies and equipment will be covered.

- **Using NBC or Expedient Shelters.** Designate and prepare shelters prior to an attack/incident and routinely use them during exercises. These shelters may include approved NBC shelters from various countries or expedient measures.

- **Using Multi-Level Buildings (Vertical Separation).** Chemical agents tend to be heavier than air (blood agents excluded). Prepare alternate C^2 and medical facilities to use floors above ground level to avoid the full impact of chemical agents. Prepare and use sealing techniques as well.

NOTE: These procedures are offered primarily for hard-to-protect facilities and unprotected HN facilities/residences. DOD agencies should strive to provide approved NBC collective protection at designated critical facilities.

Train all personnel where, when, and how to protect themselves and equipment under NBC conditions. Followup with exercises and drills to reinforce and sustain training proficiency. Post-attack actions should also be addressed during attack/incident exercises. Establish and enforce protective postures for required civilians, as well as, military forces. Establish and maintain protective equipment serviceability programs IAW specific items' technical references.

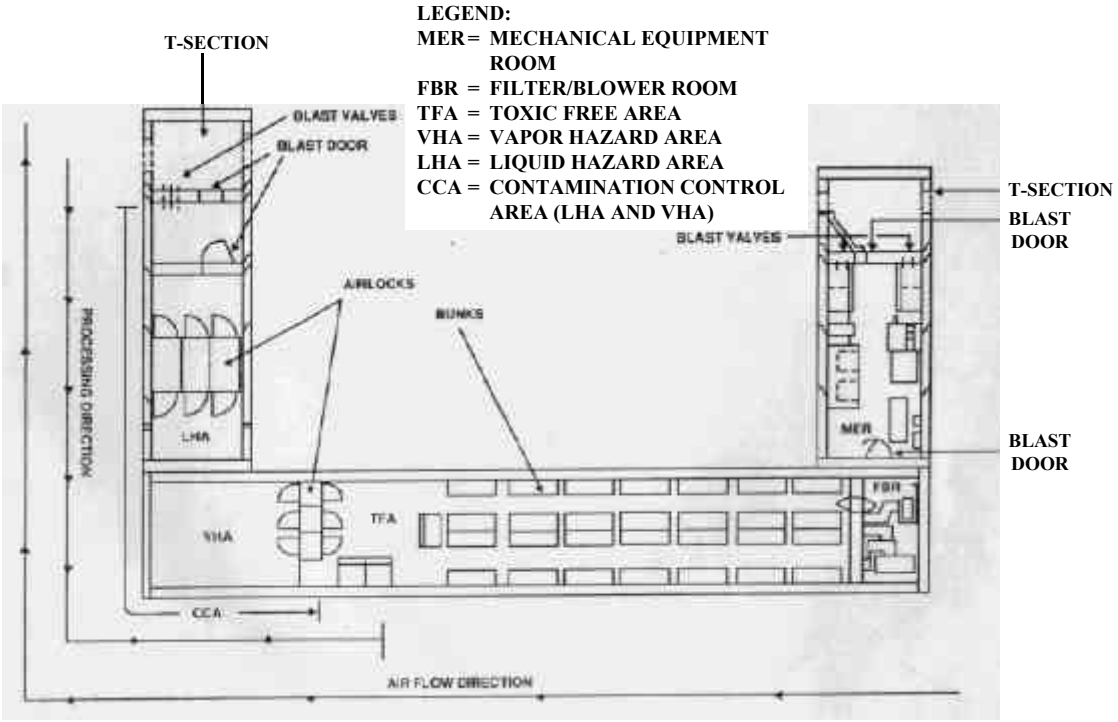
Table J-2 is designed to assist the commander in providing protection-in-place.

Table J-2.

PROTECTION -IN -PLACE OPTIONS		
For This Function:	**Use These Items:**	**With This Guidance:**
Sealing Air Infiltration Points	• Plastic Canvas • Plastic Sheeting • NBC-Protective Cover (NBC-PC) • Foam-In-Place • Gasket forming materials (silicon, rubber gaskets, foam sealing materials)	• Place plastic around inside of windows and doors. • Close holes and windows with plywood; seal using items shown and duct tape. • Spray foam into doorways and windows, overlapping all sills and openings. Foam spray will not work well on overhead horizontal surfaces. • Spray foam into all air intakes and exhausts. • Cut and fit plastic as necessary; use duct tape to hold in place. **CAUTION:** Turn off Heat, Ventilation, and AC systems before sealing air intakes/exhausts
Individual Covers	• Plastic Sheet • Plastic Canvas • NBC-PC • Military/Civilian Wet Weather Gear/ Rain Suits (Rubber) • Ponchos • Modular Chemically Hardened Tent (MCHT) • Tent Extendible Modular, Personnel (TEMPER)	• Cut plastic sheet, plastic canvas, and NBC-PC 1.5 times taller and wider than the individual using it. Use as cover to provide protection-in-place for personnel caught in the open. • Make rain suits/ponchos part of daily work uniform, use in conjunction with plastic sheet, plastic canvas, and NBC-PC. • Pre-position MCHT and TEMPER throughout fixed site, concentrate on areas with few approved shelters; but high personnel concentrations.
Materiel Covers	• Plastic Sheeting • Plastic Coated Canvas • NBC-PC • Large Area Shade Systems • Large Area Maintenance Shelter	• Cut and fit as necessary, use duct tape to hold in place. • Place covered material under shade systems or shelters for additional protection.
Shelters	• Container Express (CONEX) • Military-Owned Demountable Container (MILVAN) • Modular Command Post System (MCPS) • Modular General Purpose Tent System (MGPTS)	• Place CONEX/MILVAN at regular intervals around fixed sites. Attach plastic sheet/NBC-PC to front of CONEX/ MILVAN of sufficient size to cover the opening and to act as a liquid barrier. Attach weight (piece of wood/iron bar, etc) to bottom edge of plastic to hold in place when being used. • Erect MCPS/MGPTS at specified intervals (based on personnel concentrations) • Use these measures in conjunction with individual and materiel covers
Vertical Separation	• Plastic Sheeting • Plastic Coated Canvas • NBC-PC	• Move operations to upper floor/levels. • Block entranceways with multiply opening sheets of plastic. Place a plastic sheet at foot of stairs, another part way up the stairs a third at the top of the stairs, etc.
CAUTION: The duration of protection using these measures is not quantified and is provided for emergency situations only. This table does not preclude using other expedient measures afforded by available materials and common sense.		

Collective Protection Examples

The following figures provide graphic examples of various forms/modifications for collective protection. Figure J-9 depicts the SCPS, and although intended as a permanent shelter, several were moved from Germany during recent DOD realignments. Figure J-10 shows the Chemical Biological Protective Shelter (CBPS) used for medical support in an NBC environment.



NOTE: This typical Survivable Collective Protection System-2 (SCPS-2) is easily turned into a Command and Control (C2) Center by removing the bunks and installing equipment necessary for C^2 operations (e.g., desks, chairs, maps, communication equipment).

Figure J-9. Survivable Collective Protection System (SCPS)

385
386

Figure J-10. Chemical Biological Protective Shelter (CBPS)

PART I: ABBREVIATIONS AND ACRONYMS

AADC	area air defense commander
ACA	airspace control authority
ACADA	automatic chemical agent detector alarm
ACAMS	automatic chemical agent monitoring system
ACE	Allied Command Europe
ACR	armored cavalry regiment
ADA	air defense artillery
ADC	area damage control
AEL	airborne exposure limit
AI	area of interest
ALARA	as low as reasonably achievable
ALSS	naval advanced logistic support site
AMC	Army Materiel Command
AO	area of operations
AOR	area of responsibility
APOD	airport of debarkation
ASG	area support group
AT	antiterrorism
ATP	Allied Training Publication
AUTL	Army universal task list
BCOC	base cluster operations center
BDO	battle dress overgarment
BDOC	base defense operations center
BDZ	base defense zone
BIDS	biological integrated detection system
Bio	biological
BVO	black vinyl overboot
C^2	command and control
C^4I	command, control, communications, computers, and intelligence
CA	civil affairs
CACC	cargo aircraft contamination control
CAIRA	chemical accident and incident response and assistance
CAM	chemical agent monitor
Cat	category
CANA	convulsant antidote nerve agent
CAS	close air support
CATF	commander, amphibious task force
CB	chemical-biological
CBIRF	chemical biological incident response force
CBPS	chemical-biological protective shelter
CCA	contamination control area
CCD	camouflage, concealment, and deception
CCIR	commander's critical information requirements
CCT	contamination control teams
CD	civil defense
CDE	chemical defense equipment
CDM	chemical downwind message
CDR	commander
cGy	centigray (radiation measurement)
CI	counterintelligence
CINC	commander of a combatant command; commander in chief
CJCS	Chairman of the Joint Chiefs of Staff
CJCSM	Chairman of the Joint Chiefs of Staff Manual
CJTF	commander, joint task force

CLF	commander, landing forces
COA	course(s) of action
COE	Corps of Engineers
COM	chief of mission (US Ambassador to host nation)
COMMZ	communication zone
CONEX	container express
CONUS	continental United States (contiguous United States)
CP	command post
CPE	chemical protective ensemble
CPCA	contaminated payload control area
CPU	chemical protective undergarment
CS	combat support
CSS	combat service support
CSCC	coastal sea control commander
CTA	common table of allowances
CVC	combat vehicle crewman
DAAMS	depot area air monitoring system
DED	detailed equipment decontamination
DERP	disposable eye respiratory protection
DOD	Department of Defense
DOS	Department of State
DOT	Department of Transportation
DPST	disaster preparedness support teams
DS	direct support
DTG	date-time group
DU	depleted uranium
DZ	drop zone
EAP	emergency action plan
EAUIB	enhanced aircrew uniform integrated battlefield
EDM	effective downwind message
EDSS	equipment deployment storage system
EO	Executive Order
EOD	explosive ordnance disposal
EMP	electromagnetic pulse
EPA	Environmental Protection Agency
EPW	enemy prisoner of war
ERDEC	Edgewood Research, Development, and Engineering Center
ERT	emergency response teams
EW	electronic warfare
FM	field manual
FMFM	Fleet Marine Force Manual
FOX	NBC Reconnaissance System (NBCRS)
FRAGO	fragmentary order
FSCC	fire support coordination center
FSE	fire support element
FSO	fire support officer
G1	Army or Marine Corps component manpower or personnel staff officer (Army division or higher staff, Marine Corps brigade or higher staff)
G2	Army or Marine Corps component intelligence staff officer (Army division or higher staff, Marine Corps brigade or higher staff)
G3	Army or Marine Corps component operations staff officer (Army division or higher staff, Marine Corps brigade or higher staff)
G4	Army or Marine Corps component logistics staff officer (Army division or higher staff, Marine Corps brigade or higher staff)
G5	Army or Marine Corps component civil affairs staff officer (Army division or higher staff, Marine Corps brigade or higher staff)

G6	Army or Marine Corps component communications staff officer (Army division or higher staff, Marine Corps brigade or higher staff)
GB	Nerve Agent GB
GPM	gallons per minute
GS	General Support
GVO	green vinyl overboot
GZ	ground zero
HAZMAT	hazardous materials
HDC	harbor defense commander
HMMWV	high mobility multipurpose wheel vehicle
HN	host nation
HNS	host-nation support
HSS	health service support
HTH	high test hypochlorite
HUMINT	human intelligence
HVAC	heating, ventilating and air condition system
ICAM	improved chemical agent monitor
ICBG	improved chemical-biological protective gloves
ICPE	individual chemical protective equipment
ID	identification
IFF	identification, friend or foe
IMINT	imagery intelligence
IPB	intelligence preparation of the battlespace
IPE	individual protective equipment
IR	infrared
ISB	intermediate staging base
ISO	International Standards Organization
ISU	International Standards Unit
J-1	Manpower or Personnel Directorate of a joint staff
J-2	Intelligence Directorate of a joint staff
J-3	Operations Directorate of a joint staff
J-4	Logistics Directorate of a joint staff
J-5	Plans Directorate of a joint staff
J-6	C^4 Directorate of a joint staff
JBPDS	joint biological point detection system
JFACC	joint force air component commander
JFC	joint force commander
JIB	Joint Information Bureau
JIC	Joint Intelligence Center
JIPB	joint intelligence preparation of the battlespace
JISE	joint intelligence support element
JLOTS	joint logistics over-the-shore
JMC	joint movement center
JOA	joint operations area
JOPES	Joint Operation Planning and Execution System
JP	Joint Publication
JRA	joint rear area
JRAC	joint rear area coordinator
JRTOC	joint rear tactical operations center
JSLIST	joint service lightweight integrated suit
JTF	joint task force
JTOC	joint tactical operations center
KMPH	kilometers per hour
LCBPG	lightweight chemical biological protective garment
LDR	leader
LDS	lightweight decontamination system

LFA	liquid free area
LLR	low level radiation
LNO	liaison officer
LOC	lines of communication
LOTS	logistics over-the-shore
LP	listening post
LZ	landing zone
LOC	lines of communications, logistics operations center
LRBSDS	long range biological standoff detection system
MCHT	modular chemically hardened tent
MCWP	Marine Corps Warfighting Publication
MDMP	military decision making process
MDS	modular decontamination system
MEF	Marine expeditionary force
METL	mission essential task list
METT-T	mission, enemy, terrain and weather, troops and support available, time available
METT-TC	mission, enemy, terrain and weather, troops and support available, time available, and civilian considerations
MHE	materiel handling equipment
MILVAN	military-owned demountable container
MINICAMS	miniature continuous air monitor
MOOTW	military operations other than war
MOPP	mission oriented protective posture
MOU	memorandum of understanding
MP	military police
MSR	main supply route
mSv	milli Sieverts (radiation measurement)
MULO	multipurpose overboot
NAAK	nerve agent antidote kit
NAI	named area of interest
NAIRA	nuclear accident and incident response and assistance
NAPP	nerve agent pyridostigmine pre-treatment
NATO	North Atlantic Treaty Organization
NBC	nuclear, biological, and chemical
NBCE	NBC element
NBC-PC	NBC Protective Covers
NBCRS	NBC Reconnaissance System (FOX)
NBCRSE	NBC Retrograde Support Element
NBCWRS	NBC Warning and Reporting System
NCA	National Command Authorities
NCC	naval component commander
NCW	naval coastal warfare
NCWC	naval coastal warfare commander
NEO	noncombatant evacuation operation
NIOSH	National Institute of Operational Safety and Health
OCONUS	outside continental United States (outside contiguous United States)
OEG	operational exposure guidance
O/O	on order
OP	observation post
OPCON	operational control
OPLAN	operation plan
OPORD	operation order
OPSEC	operations security
OPTEMPO	operational tempo
PA	public affairs

PIR	priority intelligence requirements
PLT	platoon
POD	port of debarkation
POE	port of embarkation
POL	petroleum, oil, lubricants
POMCUS	positioning of material configured to unit sets
PPW	patient protective wraps
PSHDGRU	port security and harbor defense group
PSU	port security unit
PSYOP	psychological operations
R&S	reconnaissance and surveillance
RAD	radiation absorbed dose
RAOC	rear area operations center
RCA	riot control agents
RES	radiation exposure status
ROE	rules of engagement
RO/RO	roll-on/roll-off
ROTA	release other than attack
RSOI	reception, staging, onward movement, and integration
RSTA	reconnaissance, surveillance, and target acquisition
RTAP	real-time analytical platform
RTM	real-time monitor
RTOC	rear area tactical operations center
RV	radius of vulnerability
S1	battalion or brigade manpower or personnel staff officer (Army; Marine Corps battalion or regiment)
S2	battalion or brigade intelligence staff officer (Army; Marine Corps battalion or regiment)
S3	battalion or brigade operations staff officer (Army; Marine Corps battalion or regiment)
S-4	battalion or brigade logistics staff officer (Army; Marine Corps battalion or regiment)
SAT	site assessment team
SCALP	suit contamination avoidance liquid protective
SCBA	self contained breathing apparatus
SCPE	simplified collective protection equipment (NBC)
SCPS-2	survival chemical protection system-2
SG	smoke generator
SME	subject matter expert
SMT	shelter management teams
SOFA	status-of-forces agreement
SOI	signal operating instructions
SOP	standing operating procedure
SPOD	seaport of debarkation
SPOE	seaport of embarkation
SRD	secret restricted data
STANAG	standardization agreement
STB	super tropical bleach
TA	theater army
TAACOM	Theater Army Area Command
TACON	tactical control
TAP	toxicological agent protective
TBP	to be published
TC	training circular
TCF	tactical combat force
TCP	traffic control points

TFA	toxic free area
TGD	thickened nerve agent GD
THREATCON	terrorist threat condition
TIC	toxic industrial chemicals
TIH	toxic industrial hazard
TIM	toxic industrial material
TM	theater missile; technical manual
TMD	theater missile defense
TPFDD	time-phased force deployment data
TPFDL	time-phased force deployment list
TRANSCOM	Transportation Command
TREE	transient radiation effect on electronics
TSC	Theater Support Command
TTP	tactics, techniques, and procedures
TWA	time-weighted average
UJTL	universal joint task list
UN	United Nations
UNAAF	Unified Action Armed Forces
US	United States
USA	US Army
USAF	US Air Force
USCENTCOM	US Central Command
USDA	US Department of Agriculture
USMC	US Marine Corps
USN	US Navy
UTL	universal task list
UTM	universal transverse mercator
VPFRU	vapor protective flame resistant undergarment
WMD	weapons of mass destruction

PART II: TERMS AND DEFINITIONS

antiterrorism. Defensive measures used to reduce the vulnerability of individuals and property to terrorist acts, to include limited response and containment by local military forces. Also called AT. (JP 1-02)

area air defense commander. Within a unified command, subordinate unified command, or joint task force, the commander will assign overall responsibility for air defense to a single commander. Normally, this will be the component commander with the preponderance of air defense capability and the command, control, and communications capability to plan and execute integrated air defense operations. Representation from the other components involved will be provided, as appropriate, to the area air defense commander's headquarters. Also called AADC. (JP 1-02)

area command. A command that is composed of those organized elements of one or more of the armed services, designated to operate in a specific geographical area, which are placed under a single commander. (JP 1-02)

area damage control. Measures taken before, during or after hostile action or natural or manmade disasters, to reduce the probability of damage and minimize its effects. (JP 1-02)

area of operations. An operational area defined by the joint force commander for land and naval forces. Areas of operation do not typically encompass the entire operational area of the joint force commander, but should be large enough for component commanders to accomplish their missions and protect their forces. (JP 1-02)

area of responsibility. 1. The geographical area associated with a combatant command within which a combatant commander has authority to plan and conduct operations. 2. In naval usage, a predefined area of enemy terrain for which supporting ships are responsible for covering by fire on known targets or targets of opportunity and by observation. Also called AOR. (JP 1-02)

base. 1. A locality from which operations are projected or supported. 2. An area or locality containing installations which provide logistic or other support. 3. Home airfield or home carrier. (JP 1-02)

base cluster. In base defense operations, a collection of bases, geographically grouped for mutual protection and ease of command and control. (JP 1-02)

base cluster commander. In base defense operations, the senior officer in the base cluster (excluding medical officers, chaplains, and commanders of transient units), with responsibility for coordinating the defense of bases within the base cluster, and for integrating base defense plans of bases into a base cluster defense plan. (JP 1-02)

base cluster operations center. A command and control facility that serves as the base cluster commander's focal point for defense and security of the base cluster. (JP 1-02)

base commander. In base defense operations, the officer assigned to command a base. (JP 1-02)

base defense. The local military measures, both normal and emergency, required to nullify or reduce the effectiveness of enemy attacks on, or sabotage of, a base, to ensure that the maximum capacity of its facilities is available to US forces. (JP 1-02)

base defense forces. Troops assigned or attached to a base for the primary purpose of base defense and security, and augmentees and selectively armed personnel available to the base for base defense from units performing primary missions other than base defense. (JP 1-02)

base defense operations center. A command and control facility established by the base commander to serve as the focal point for base security and defense. It plans, directs, integrates, coordinates, and controls all base defense efforts and coordinates and integrates into area security operations with the rear area operations center/rear tactical operations center. (JP 1-02)

base defense zone. An air defense zone established around an air base and limited to the engagement envelope of short-range air defense weapons systems defending that base. Base defense zones have specific entry, exit, and identification, friend or foe procedures established. Also called BDZ. (JP 1-02)

biological agent. A microorganism that causes disease in man, plants, or animals, or deterioration of materiel. (JP 1-02)

centers of gravity. Those characteristics, capabilities, or localities from which a military force derives its freedom of action, physical strength, or will to fight. (JP 1-02)

civil affairs. The activities of a commander that establish, maintain, influence, or exploit relations between military forces and civil authorities, both governmental and nongovernmental, and the civilian populace in a friendly, neutral, or hostile area of operations in order to facilitate military operations and consolidate operational objectives. Civil affairs may include performance by military forces of activities and functions normally the responsibility of local government. These activities may occur prior to, during, or subsequent to other military actions. They may also occur, if directed, in the absence of other military operations. (JP 1-02)

civil-military operations. Group of planned activities in support of military operations that enhance the relationship between the military forces and civilian authorities and population and which promote the development of favorable emotions, attitudes, or behavior in neutral, friendly, or hostile groups. (JP 1-02)

coastal sea control. The employment of forces to ensure the unimpeded use of an offshore coastal area by friendly forces and, as appropriate, to deny the use of the area to enemy forces. (JP 1-02)

collective nuclear, biological, and chemical protection. Protection provided to a group of individuals in a nuclear, biological, and chemical environment which permits relaxation of individual nuclear, biological, and chemical protection. (JP 1-02) (Also referred to as collective protection)

combatant commander. A commander in chief of one of the unified or specified combatant commands established by the President. (JP 1-02)

combat service support. The essential capabilities, functions, activities, and tasks necessary to sustain all elements of operating forces in theater at all levels of war. Within the national and theater logistic systems, it includes but is not limited to that support rendered by service forces in ensuring the aspects of supply, maintenance, transportation, health services, and other services required by aviation and ground combat troops to permit those units to accomplish their missions in combat. Combat service support encompasses those activities at all levels of war that produce sustainment to all operating forces on the battlefield. (JP 1-02)

combat support elements. Those elements whose primary missions are to provide combat support to the combat forces and which are a part, or prepared to become a part, of a theater, command, or task force formed for combat operations. (JP 1-02)

command and control. The exercise of authority and direction by a properly designated commander over assigned and attached forces in the accomplishment of the mission. Command and control functions are performed through an arrangement of personnel, equipment, communications, facilities, and procedures employed by a commander in planning, directing, coordinating and controlling forces and operations in the accomplishment of the mission. (JP 1-02)

communications zone. Rear part of theater of operations (behind but contiguous to the combat zone) which contains the lines of communications, establishments for supply and evacuation, and other agencies required for the immediate support and maintenance of the field forces. (JP 1-02)

complete decontamination. The process of reducing the level of the contamination hazard of a surface so that it will pose no threat of transfer. (FM 3-4-1/MCWP 3-37.5)

concept of logistic support. A verbal or graphic statement, in broad outline, of how a commander intends to support and integrate with a concept of operations in an operation or campaign. (JP 1-02)

contaminate. To introduce an impurity; for instance, a foreign microorganism placed in a culture or environment. Clothing containing microorganisms is said to be contaminated. (FM 3-4-1/MCWP 3-37.5)

contamination. 1. The deposit and/or absorption of radioactive material or biological or chemical agents on and by structures, areas, personnel, or objects. 2. Food and/or water made unfit for consumption by humans or animals because of the presence of environmental chemicals, radioactive elements, bacteria, or organisms. 3. The by-product of the growth of bacteria or

organisms in decomposing material (including food substances) or waste in food or water. (JP 1-02)

coordinating authority. A commander or individual assigned responsibility for coordinating specific functions or activities involving forces of two or more Military Departments or two or more forces of the same Service. The commander or individual has the authority to require consultation between the agencies involved, but does not have the authority to compel agreement. In the event that essential agreement cannot be obtained, the matter shall be referred to the appointing authority. Coordinating authority is a consultation relationship, not an authority through which command may be exercised. Coordinating authority is more applicable to planning and similar activities than to operations. (JP 1-02)

counterintelligence. Information gathered and activities conducted to protect against espionage, other intelligence activities, sabotage, or assassinations conducted by or on behalf of foreign governments or elements thereof, foreign organizations, or foreign persons, or international terrorist activities. Also called CI. (JP 1-02)

deception. Those measures designed to mislead the enemy by manipulation, distortion, or falsification of evidence to induce him to react in a manner prejudicial to his interests. (JP 1-02)

decontaminant. Any substance used to break down, neutralize, or remove a chemical, biological, or radioactive material posing a threat to equipment or personnel. (FM 3-100/MCWP 3-37.1)

decontamination. The process of making any person, object, or area safe by absorbing, destroying, neutralizing, making harmless, or removing, chemical or biological agents, or by removing radioactive material clinging to or around it. (JP 1-02)

effective US control. Merchant ships, majority owned by US citizens or corporations that are operated under Liberian, Panamanian, Honduran, Bahamian, and Marshall Islands registries. These ships are considered requisitionable assets available to the US Government in time of national emergency and therefore under the effective control of the US Government. (JP 1-02)

electromagnetic pulse. The electromagnetic radiation from a nuclear explosion caused by Compton-recoil electrons and photoelectrons from photons scattered in the materials of the nuclear device or in a surrounding medium. The resulting electric and magnetic fields may couple with electrical/electronic systems to produce damaging current and voltage surges. May also be caused by nonnuclear means. Also called EMP. (JP 1-02)

essential elements of information. The critical items of information regarding the enemy and the environment needed by the commander by a particular time to relate with other available information and intelligence in order to assist in reaching a logical decision. Also called EEI. (JP 1-02)

evacuation. 1. The process of moving any person who is wounded, injured, or ill to and/or between medical treatment facilities. 2. The clearance of personnel, animals, or materiel from a given locality. 3. The controlled process of collecting, classifying, and shipping unserviceable or abandoned materiel, United States and foreign, to appropriate reclamation, maintenance, technical intelligence, or disposal facilities. (JP 1-02)

fixed site. Developed real estate (facilities and supporting equipment) required to accomplish an operational mission. For example: C^4I, SPOD, APOD, POMCUS sites, ammunition storage points/depots, hospitals, supply depots, maintenance sites, bridges, etc. Fixed sites can be further categorized as permanently or operationally fixed. (Proposed in JP 3-11 revision and FM 3-4-1/MCWP 3-37.5)

frustrated cargo. Any shipment of supplies and/or equipment which while en route to destination is stopped prior to receipt and for which further disposition instructions must be obtained. (JP 1-02)

host nation. A nation which receives the forces and/or supplies of allied nations and/or NATO organizations to be located on, or to operate in, or to transit through its territory. (JP 1-02)

host-nation support. Civil and/or military assistance rendered by a nation to foreign forces within its territory during peacetime, crises or emergencies, or war based on agreements mutually concluded between nations. (JP 1-02)

joint base. For purposes of base defense operations, a joint base is a locality from which operations of two or more of the Military Departments are projected or supported and which is manned by significant elements of two or more Military Departments or in which significant elements of two or more Military Departments are located. (JP 1-02)

joint rear area. A specific land area within a joint force commander's operational area designated to facilitate protection and operation of installations and forces supporting the joint force. (JP 1-02)

joint rear area coordinator. The officer with responsibility for coordinating the overall security of the joint rear area in accordance with joint force commander directives and priorities in order to assist in providing a secure environment to facilitate sustainment, host nation support, infrastructure development, and movements of the joint force. The joint rear area coordinator also coordinates intelligence support and ensures that area management is practiced with due consideration for security requirements. Also called JRAC. (JP 1-02)

joint rear area operations. Those operations in the joint rear area that facilitate protection or support of the joint force. (Approved for inclusion in the next edition of JP 1-02.)

joint rear tactical operations center. A joint operations cell tailored to assist the joint rear area coordinator in meeting mission responsibilities. Also called JRTOC. (JP 1-02)

joint force commander. A general term applied to a combatant commander, subunified commander, or joint task force commander authorized to exercise combatant command (command authority) or operational control over a joint force. Also called JFC. (JP 1-02)

joint logistics. The art and science of planning and carrying out, by a joint force commander and staff, logistic operations to support the protection, movement, maneuver, firepower, and sustainment of operating forces of two or more Military Departments of the same nation. (JP 1-02.)

joint movement center. The center established to coordinate the employment of all means of transportation (including that provided by allies or host nations) to support the concept of operations. This coordination is accomplished through establishment of transportation policies within the assigned area of responsibility, consistent with relative urgency of need, port and terminal capabilities, transportation asset availability, and priorities set by a joint force commander. (JP 1-02)

lines of communications. All the routes, land, water, and air, which connect an operating military force with a base of operations and along which supplies and military forces move. Also called LOC. (JP 1-02)

logistics. The science of planning and carrying out the movement and maintenance of forces. In its most comprehensive sense, those aspects of military operations which deal with: a. design and development, acquisition, storage, movement, distribution, maintenance, evacuation, and disposition of materiel; b. movement, evacuation, and hospitalization of personnel; c. acquisition or construction, maintenance, operation, and disposition of facilities; d. acquisition or furnishing of services. (JP 1-02)

logistics-over-the-shore operations. The loading and unloading of ships without the benefit of fixed port facilities, in friendly or nondefended territory, and, in time of war, during phases of theater development in which there is no opposition by the enemy. (JP 1-02)

military capability. The ability to achieve a specified wartime objective (win a war or battle, destroy a target set). It includes four major components: force structure, modernization, readiness, and sustainability. a. force structure—Numbers, size, and composition of the units that comprise our Defense forces; e.g., divisions, ships, airwings. b. modernization—Technical sophistication of forces, units, weapon systems, and equipment. c. unit readiness—The ability to provide capabilities required by the combatant commanders to execute their assigned missions. This is derived from the ability of each unit to deliver the outputs for which it was designed. d. sustainability—The ability to maintain the necessary level and duration of operational activity to achieve military objectives. Sustainability is a function of providing for and maintaining those levels of ready forces, materiel, and consumables necessary to support military effort. (JP 1-02)

MOPP. mission-oriented protective posture; a flexible system for protection against a chemical or biological attack devised to maximize the unit's ability to accomplish its mission in a toxic environment. This posture permits maximum protection from chemical or biological attack without unacceptable reduction in efficiency,. (FM 101-5-1/MCRP 5-2A)

MOPP gear. Protective clothing and equipment worn appropriate to the threat, work rate imposed by the mission, temperature, and humidity. (FM 3-3/FMFM 11-17)

movement control. 1. The planning, routing, scheduling, and control of personnel and cargo movements over lines of communications. 2. An organization responsible for the planning, routing, scheduling, and control of personnel and cargo movements over lines of communications. Also called movement control center. (JP 1-02)

naval advanced logistic support site. An overseas location used as the primary transshipment point in the theater of operations for logistic support. A naval advanced logistic support site possesses full capabilities for storage, consolidation, and transfer of supplies and for support of forward-deployed units (including replacement units) during major contingency and wartime periods. Naval advanced logistic support sites, with port and airfield facilities in close proximity, are located within the theater of operations but not near the main battle areas, and must possess the throughput capacity required to accommodate incoming and outgoing intertheater airlift and sealift. When fully activated, the naval advanced logistic support sites should consist of facilities and services provided by the host nation, augmented by support personnel located in the theater of operations, or both. Also called ALSS. See also naval forward logistic site. (JP 1-02)

naval coastal warfare. Coastal sea control, harbor defense, and port security, executed both in coastal areas outside the United States in support of national policy and in the United States as part of this Nation's defense. Also called NCW. (JP 1-02)

naval coastal warfare area. An assigned geographic area of operations which includes offshore waters, harbor approaches, harbors, ports, waterfront facilities, and those internal waters and rivers which provide access to port facilities. (Approved for inclusion in the next edition of JP 1-02)

naval coastal warfare commander. An officer designated to conduct naval coastal warfare missions within a designated naval coastal geographic area. Also called NCWC. (JP 1-02)

naval forward logistic site. An overseas location, with port and airfield facilities nearby, which provides logistics support to naval forces within the theater of operations during major contingency and wartime periods. Naval forward logistic sites may be located in close proximity to main battle areas to permit forward staging of services, throughput of high priority cargo, advanced maintenance, and battle damage repair. Naval forward logistic sites are linked to in-theater naval advanced logistics support sites (ALSSs) by intratheater airlift and sealift, but may also serve as transshipment points for intertheater movement of high-priority cargo into areas of direct combat. In providing fleet logistic support, naval forward logistic site capabilities may range from very austere to near those of a naval advanced logistic support site. Also called FLS. See also naval advanced logistic support site. (JP 1-02)

nongovernmental organizations. Transnational organizations of private citizens that maintain a consultative status with the Economic and Social Council of the United Nations. Nongovernmental organizations may be professional associations, foundations, multinational businesses, or simply groups with a common interest in humanitarian assistance activities (development and relief). "Nongovernmental organizations" is a term normally used by non-United States organizations. Also called NGO. (JP 1-02)

operational control. Transferable command authority that may be exercised by commanders at any echelon at or below the level of combatant command. Operational control is inherent in combatant command (command authority). Operational control may be delegated and is the authority to perform those functions of command over subordinate forces involving organizing and employing commands and forces, assigning tasks, designating objectives, and giving authoritative direction necessary to accomplish the mission. Operational control includes authoritative direction over all aspects of military operations and joint training necessary to accomplish missions assigned to the command. Operational control should be exercised through the commanders of subordinate organizations. Normally this authority is exercised through subordinate joint force commanders and Service and/or functional component commanders. Operational control normally provides full authority to organize commands and forces and to employ those forces as the commander in operational control considers necessary to accomplish assigned missions. Operational control does not, in and of itself, include authoritative direction for logistics or matters of administration, discipline, internal organization, or unit training. Also called OPCON. (JP 1-02)

operational environment. A composite of the conditions, circumstances, and influences which affect the employment of military forces and bear on the decisions of the unit commander. Some examples are: a. permissive environment--operational environment in which host country military and law enforcement agencies have control and the intent and capability to assist operations that a unit intends to conduct. b. uncertain environment--operational environment in which host government forces, whether opposed to or receptive to operations that a unit intends to conduct, do not have totally effective control of the territory and population in the intended area of operations. c. hostile environment--operational environment in which hostile forces have control and the intent and capability to effectively oppose or react to the operations a unit intends to conduct. (JP 1-02)

operationally fixed sites. Facilities transportable or mobile, but due to ongoing operational constraints, they are not moved. Examples include the movement of field hospitals or critical communications nodes just prior to commencing offensive operations. (FM 3-4-1/MCWP 3-37.5)

permanently fixed sites. Facilities than can not move. These include pre-existing facilities such as ports, airfields, railheads, and hospitals. If war or conflict comes to these facilities, they may be abandoned, but not moved. Additionally, if WMD make these facilities unusable, they are abandoned at least until transition to post-conflict operations. (FM 3-4-1/MCWP 3-37.5)

port. A place at which ships may discharge or receive their cargoes. It includes any port accessible to ships on the seacoast, navigable rivers or inland waterways. The term "ports" should not be used in conjunction with air facilities which are designated as aerial ports, airports, etc. (JP 1-02)

port security. The safeguarding of vessels, harbors, ports, waterfront facilities and cargo from internal threats such as: destruction, loss, or injury from sabotage or other subversive acts; accidents; thefts; or other causes of similar nature. (JP 1-02)

private voluntary organizations. Private, nonprofit humanitarian assistance organizations involved in development and relief activities. Private voluntary organizations are normally United States-based. "Private voluntary organization" is often used synonymously with the term "nongovernmental organizations." Also called PVO. (JP 1-02)

psychological operations. Planned operations to convey selected information and indicators to foreign audiences to influence their emotions, motives, objective reasoning, and ultimately the behavior of foreign governments, organizations, groups, and individuals. The purpose of psychological operations is to induce or reinforce foreign attitudes and behavior favorable to the originator's objectives. Also called PSYOP. (JP 1-02)

rear area. For any particular command, the area extending forward from its rear boundary to the rear of the area assigned to the next lower level of command. This area is provided primarily for the performance of support functions. (Approved for inclusion in the next edition of JP 1-02.)

rear area operations center/rear tactical operations center. A command and control facility that serves as an area/sub-area commander's planning, coordinating, monitoring, advising, and directing agency for area security operations. (JP 1-02)

reception. 1. All ground arrangements connected with the delivery and disposition of air or sea drops. Includes selection and preparation of site, signals for warning and approach, facilitation of secure departure of agents, speedy collection of delivered articles, and their prompt removal to storage places having maximum security. When a group is involved, it may be called a reception committee. 2. Arrangements to welcome and provide secure quarters or transportation for defectors, escapees, evaders, or incoming agents. (JP 1-02)

reconstitution. Those actions that commanders plan and implement to restore units to a desired level of combat effectiveness commensurate with mission requirements and available resources. Reconstitution operations include regeneration and reorganization. (FM 101-5-1/MCRP 5-2A)

reconstitution site. A location selected by surviving command authority as the site at which a damaged or destroyed headquarters can be reformed from survivors of the attack and/or personnel from other sources, predesignated as replacements. (JP 1-02)

recovery and reconstitution.) Those actions taken by one nation prior to, during, and following an attack by an enemy nation to minimize the effects of the attack, rehabilitate the national economy, provide for the welfare of the populace, and maximize the combat potential of remaining forces and supporting activities. (JP 1-02)

redeployment. The transfer of a unit, an individual, or supplies deployed in one area to another area, or to another location within the area, or to the zone of interior for the purpose of further employment. (JP 1-02)

remediation. The act or process of remedying [correcting or counteracting].

response force. A mobile force with appropriate fire support designated, usually by the area commander, to deal with Level II threats in the rear area. (JP 1-02)

restoration. The systematic removal of pollution or contaminants from the environment, especially from the soil or ground water, by physical, chemical, or biological means. Restoration is also known as remediation or environmental cleanup. (FM 101-5-1/MCRP 5-2A)

restoration operations. Measures taken to return personnel and units to near-normal operating capability after NBC attack. (Joint Services Integration Group, *Joint Concept for NBC Force Protection*)

retrograde cargo. Cargo evacuated from a theater of operations. (JP 1-02)

retrograde movement. Any movement of a command to the rear, or away from the enemy. It may be forced by the enemy or may be made voluntarily. Such movements may be classified as withdrawal, retirement, or delaying action. (JP 1-02)

rules of engagement. Directives issued by competent military authority which delineate the circumstances and limitations under which United States forces will initiate and/or continue combat engagement with other forces encountered. Also called ROE. (JP 1-02)

security. 1. Measures taken by a military unit, an activity or installation to protect itself against all acts designed to, or which may, impair its effectiveness. 2. A condition that results from the establishment and maintenance of protective measures that ensure a state of inviolability from hostile acts or influences. 3. With respect to classified matter, it is the condition that prevents unauthorized persons from having access to official information that is safeguarded in the interests of national security. (JP 1-02)

supporting forces. Forces stationed in, or to be deployed to, an area of operations to provide support for the execution of an operation order. Combatant command (command authority) of supporting forces is not passed to the supported commander. (JP 1-02)

status-of-forces agreement. An agreement which defines the legal position of a visiting military force deployed in the territory of a friendly state. Agreements delineating the status of visiting military forces may be bilateral or multilateral. Provisions pertaining to the status of visiting forces may be set forth in a separate agreement, or they may form a part of a more comprehensive agreement. These provisions describe how the authorities of a visiting force may control members of that force and the amenability of the force or its members to the local law or to the authority of local officials. To the extent that agreements delineate matters affecting the relations between a military force and civilian authorities and population, they may be considered as civil affairs agreements. Also called SOFA. (JP 1-02)

subordinate command. A command consisting of the commander and all those individuals, units, detachments, organizations, or installations that have been placed under the command by the authority establishing the subordinate command. (JP 1-02)

sustainability See military capability. (JP 1-02)

tactical combat force. A combat unit, with appropriate combat support and combat service support assets, that is assigned the mission of defeating Level III threats. (JP 1-02)

tactical control. Command authority over assigned or attached forces or commands, or military capability or forces made available for tasking, that is limited to the detailed and, usually, local direction and control of movements or maneuvers necessary to accomplish missions or tasks assigned. Tactical control is inherent in operational control. Tactical control may be delegated to,

and exercised at any level at or below the level of combatant command. Also called TACON. (JP 1-02)

time-phased force and deployment data. The Joint Operation Planning and Execution System data base portion of an operation plan; it contains time-phased force data, non-unit-related cargo and personnel data, and movement data for the operation plan, including: a. In-place units. b. Units to be deployed to support the operation plan with a priority indicating the desired sequence for their arrival at the port of debarkation. c. Routing of forces to be deployed. d. Movement data associated with deploying forces. e. Estimates of non-unit-related cargo and personnel movements to be conducted concurrently with the deployment of forces. f. Estimate of transportation requirements that must be fulfilled by common-user lift resources as well as those requirements that can be fulfilled by assigned or attached transportation resources. Also called TPFDD. (JP 1-02)

time weighted average (TWA). For the purposes of this manual TWA's are expressed as a function of airborne exposure limits (AEL) and are levels that for a normal 8-hour work day and a 40-hour work week will result in no known health effects to nearly all unmasked workers exposed day-after-day. Unprotected personnel will not be intentionally exposed to chemical agent concentrations exceeding 0.0001 mg/m^3 (GA or GB); 0.00003 mg/m^3 (GD); 0.00001 mg/m^3 (VX); and 0.003 mg/m^3 (H or L) for any period of time.

weapons of mass destruction. In arms control usage, weapons that are capable of a high order of destruction and/or of being used in such a manner as to destroy large numbers of people. Can be nuclear, chemical, biological, and radiological weapons, but excludes the means of transporting or propelling the weapon where such means is a separable and divisible part of the weapon. (JP 1-02)

802

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Joint Pub 4-04, "Joint Doctrine for Civil Engineering Support."
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FM 3-3-1/FMFM 11-8, Nuclear Contamination Avoidance
FM 3-4/FMFM 11-9, "NBC Protection"
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134